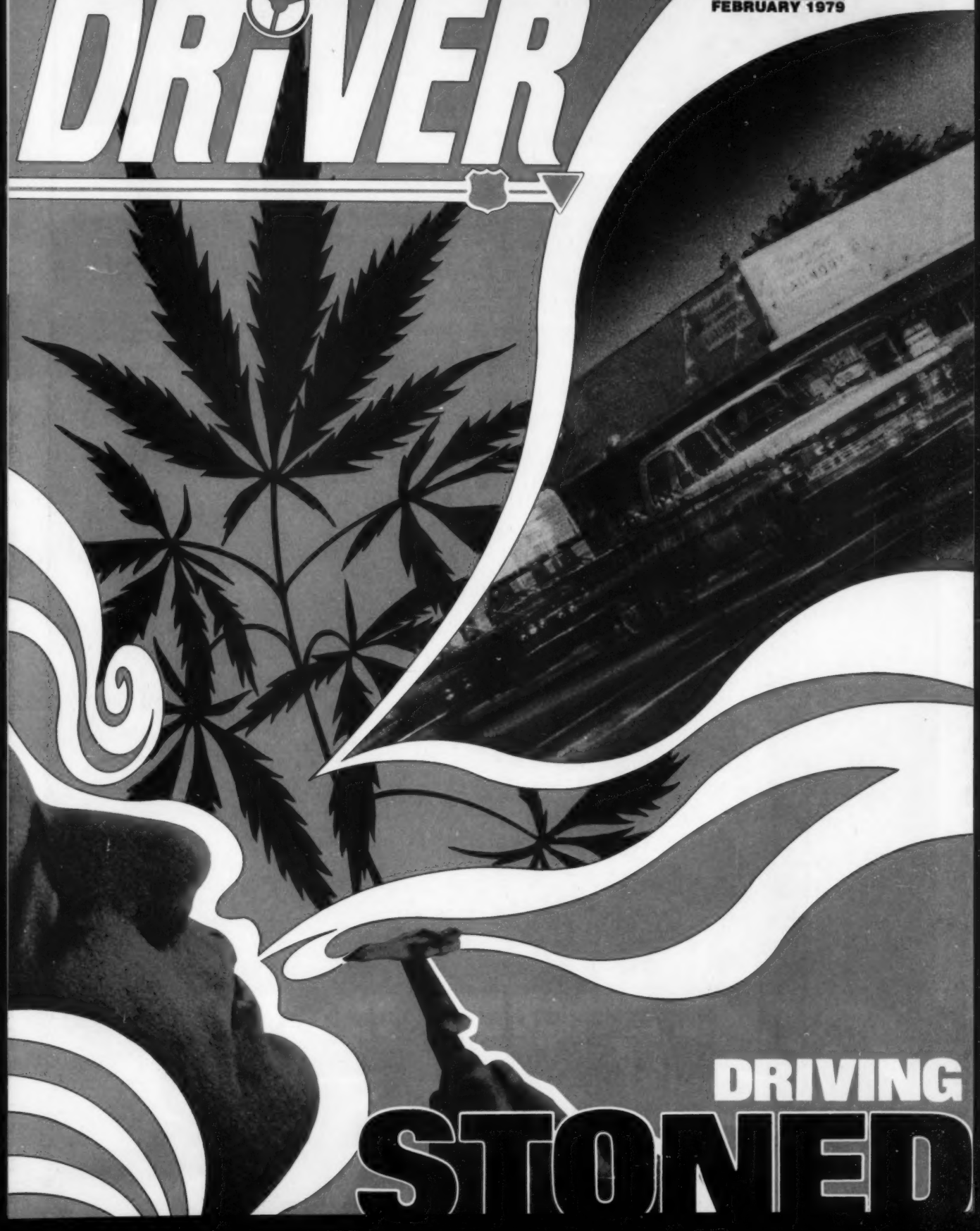
DRIVER

FEBRUARY 1979



DRIVING STONED

DRiVER
LIQUORS

Driving Stoned

If you're at all interested in the subject of marijuana, you've probably seen the film "Up in Smoke," with Cheech and Chong. There's a scene in which our heroes light up a huge, foot-long joint in their car and drive down the highway, the car filled with smoke.

If that were the only danger in driving while stoned, we wouldn't be very worried about it. Even a foot-long joint wouldn't put out that much smoke, and if it did, opening the windows would probably solve the problem.

However, there is a growing body of evidence that being stoned *does* negatively affect your ability to drive safely, and that's why we're here.

We expect we'll hear from people who'll say, "Why pick on me? Get after those drunks! *They're* the dangerous ones!" If you'll take a glance at our June 1978 issue of DRIVER, you'll see a treatment of the drinking and driving problem. However, now we're concerned with the *smoking* and driving problem. And, no, we don't mean tobacco.

In this discussion we will not go into the "rights and wrongs" of marijuana. You all know it's illegal, and you can read almost daily the reports in the newspapers of its possible long-term effects. You don't need to read that stuff in DRIVER.

Our area of interest is traffic safety, not drugs *per se*. We want to make sure you don't drive under the influence of marijuana, which is driving with your abilities impaired. So if you expected a treatise on permanent mental damage or chromosome damage or something, you'll be surprised because you won't get it. Isn't that nice? But read on; we think you'll find the information in this piece interesting, informative and, most of all, valuable to you personally.

Survey data on the numbers of people who use pot varies, but we know a lot of you use marijuana, and you probably have driven under its influence. Perhaps you do so regularly. We want to show you that's a bad idea.

"High" There! Marijuana is used, like alcohol, to produce an intoxicated condition—a "high." And, as with alcohol, there are side-effects, some of which could make driving hazardous. Don't believe us? There are a lot of people who think so, even some who favor legalization of the stuff.

This is from "A Child's Garden of Grass, The Official Handbook for

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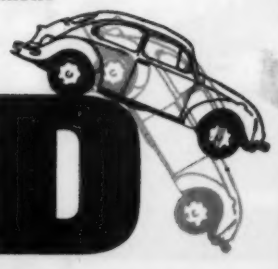
Our thanks to Dr. Herbert Moskowitz of the University of California at Los Angeles, and California State University; and to Victor Reeve of the California Department of Justice, for their assistance, and for providing copies of the studies from which this article was written.



STONED

by JERI E. ROOD

DRIVER

THE
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FOR THE MILITARY DRIVER

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THE EDITOR SPEAKS
DOUBLE CLUTCH

FLAT TIRES—NEVER AGAIN?

The governments of many "motorized" countries have been asking the tire industry for a low-air-pressure warning device for car tires. Our own NHTSA has called for such a device on all new cars in 1981. Austria will require them on all cars (not just new ones) after January 1982. And the Japanese say the basic design for their new traffic systems makes it compulsory to have a puncture-warning device soon.

American companies have been working on the idea and it was once reported that General Motor's new 1980 front-drive compacts would have such a device so there would be no need for

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Certain individuals shown in this magazine are not members of the Air Force and therefore do not conform to Air Force grooming standards.

Marijuana Users," a popular book on pot:

"Your awareness of time and space also becomes confused. Things seem to take an unearthly long time, although sometimes, much less often, things which should take a long time, seem to have zipped by in an instant. . . . Space alteration is totally unpredictable. Sometimes the room looks longer or shorter. The ceiling is three floors above you or an inch from your head. Maybe there will be no space alteration in your room whatever, but get up and walk down a flight of stairs and that flight of stairs becomes infinite.

"It should be obvious that things which require good judgment of time and space should be scrupulously avoided when stoned. Things to especially avoid are cooking an egg, **driving a car,** and tightrope walking." (emphasis ours) Although the point is made humorously in the book, it is well taken.

From "The Gourmet Guide to Grass": "The author in no way advocates driving while stoned on anything."

And R. Keith Stroup, of the National Organization for Reform of Marijuana Laws (NORML), has also warned it is not safe to drive while stoned.

The drug in pot: What is the stuff? Marijuana, or grass or pot or whatever you want to call it, is the substance of the *cannabis sativa* plant. The plant is easy to recognize with its distinctive five-bladed, saw-toothed leaves. Most marijuana used in the United States is grown south of the border.

The leaves, seeds, and stems of the plant can all produce the intoxicating effect of marijuana, but it is the leaves that are the most potent. The leaves contain the greatest amount of a class of drugs collectively known as tetrahydrocannabinols, or THC. THC is the active ingredient in grass, and it is this chemical that produces the "high."

Here's what the plant looks like. But as a potted plant for your living room, a pot plant could cause you a few problems.

The dried leaves of the plant are smoked, either in cigarettes (or joints," "bombers," "reefers," etc.) or in a variety of pipes. THC also comes in the form of hashish ("hash"), the resin extracted from the plant. This is also smoked.

The symptoms of marijuana intoxication are listed as drowsiness, excitation and hyperactivity, irritability and restlessness, anxiety, euphoria, depression, hallucinations, panic, talkativeness, laughter, impairment of coordination, inflamed eyes, increased appetite, and distortion of time and space.

Whatever your personal feelings on the subject, you will probably agree the last effect listed, distortion of time and space, is a common occurrence. And it should interest us in a discussion of the effects of a marijuana high on driving performance. Such effects on perception, and on other things like attention and tracking ability, have been the focus of scientific studies in recent years.

Don't worry; we won't go into a lot of the details of the experiments that have been done, because they are intricate, and sometimes not easily put into simple terms. We'll explain some of them, and quote from the results of others. We've provided a bibliography at the end for those interested. Also, this is not meant to be an all-encompassing article on marijuana, bur rather a "sampler" of the studies on its effects. If any DRIVER readers have other new data or statistics, we'll be glad to hear from you.

That out of the way, let's look at the areas we mentioned – perception, attention and tracking ability – one at a time to see what the researchers have discovered.

Perception: Dr. Herbert Moskowitz of the University of California at Los Angeles has done a considerable amount of work on the effects of marijuana, much of it in connection with driving. In a study comparing the effects of alcohol and marijuana on visual perception, Moskowitz writes:

"Without understanding the mechanisms inducing the visual deficits in complex perceptual functions found under marijuana, it is difficult to esti-

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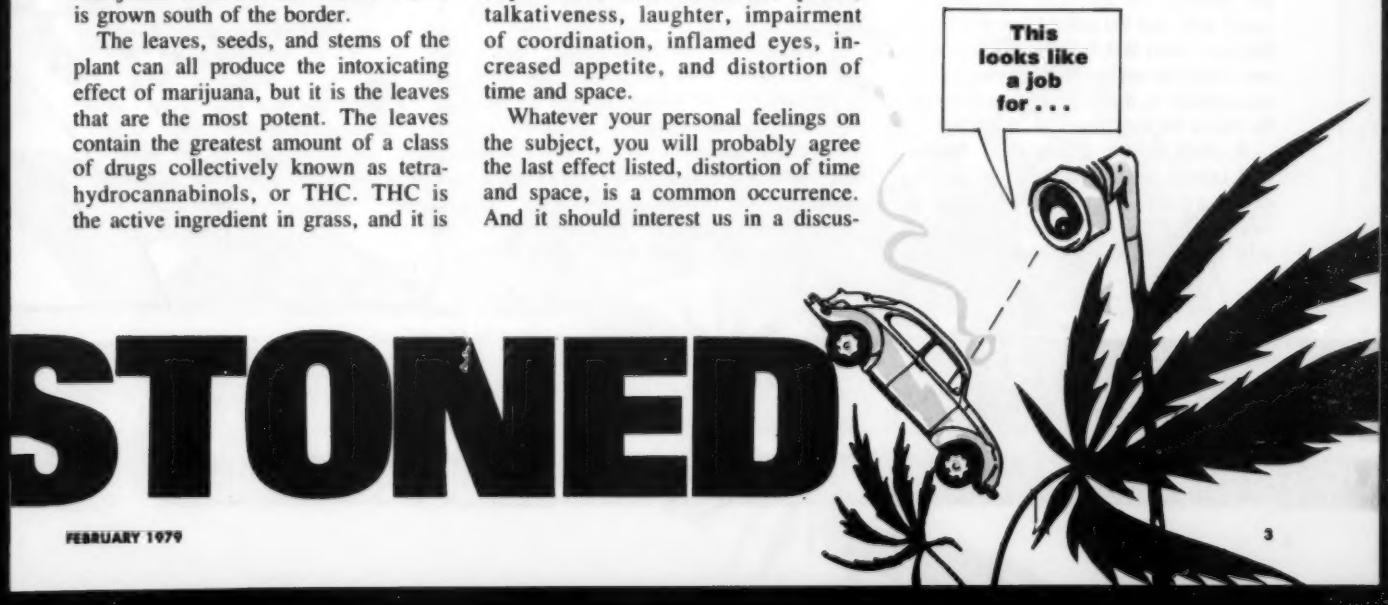

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Driving safely requires constant attention to what you're doing. While you're stoned, your sense of time and space, and your ability to concentrate, suffer. Try watching everything our friend here has to watch while you're stoned and you'll see what we mean—or better yet, *don't* try it.

mate the degree of impairment likely to be found in man/machine interactions such as flying or driving. We suggest that leaping to the conclusion that marijuana will induce a greater impairment than alcohol because in these tests the marijuana deficit was more extensive is an error. . . . Two recent studies conducted on a driving simulator, by Moskowitz, Hulbert and McGlothlin, suggest that the alcohol impairment appears larger, although both definitely produced impairment. However, it is certainly clear that marijuana does impair visual perceptual performance to a large degree and **potential users should be warned that it is likely to lead to accidents."** (Emphasis added)

Please note the comments about which has the greater effect. Marijuana affects the ability to drive in ways that are perhaps subtler than the ways alcohol will, but the effects are still there. But note also that we aren't advocating one over the other. Neither one is safe as a prelude to driving out to the movies. So much for the booze vs. grass debate.

A study by Dr. Anthony J. Adams, and others, on the effects of alcohol and marijuana on color perception revealed, "We have shown a statistically significant impairment in color discrimination . . . following alcohol or marijuana intoxication. The impairment is predominantly localized in the blue region of the color circle, although alcohol produces additional impairment in the yellow-green, and marijuana in the yellow-red, region. . . . The transient impairment, which cannot be explained by a general drug-induced loss of test aptitude, may have practical implications in tasks where stable color perception is important." **Like traffic signals, maybe?**

Attention: Another focus of the studies on marijuana has been the function of attention. Dr. Moskowitz has performed experiments in which the volunteers respond to visual and audible signals, sometimes with their attention divided between the main task and other tasks. In these studies the marijuana caused performance to suffer, and the higher the dosage, the worse the performance.

As a result of one study on the effects of marijuana and vigilance, Moskowitz and Dr. Satanand Sharma wrote, "These results suggest that under marijuana, tasks that require sustained attention will suffer initial impairment, followed by further performance decline over time. . . . The findings of this study are important for **safety con-**

continued

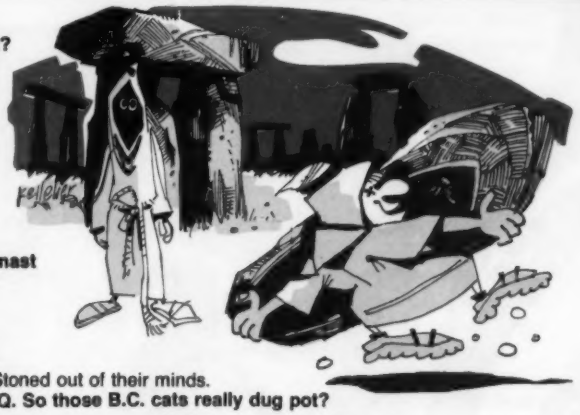
POT SHOTS

An interview with Grassman—Fearless Fighter of the Funny Fumes

Q. Where did pot originate?
A. Marijuana originated in Central Asia, that immense temperate area extending from eastern Europe to China.
Q. Is there any record of the first time marijuana was used?
A. Earliest use of grass occurred the day after a caveman named Wog invented the wheel. Wog was contemplating his invention while chewing reflectively on what he thought was a blade of winter rye. Actually, the grass he was masticating was a mouthful of "Caveman Gold" that grew wild in the area. Soon Wog was tripping on his new wheel, which ran over and killed him. This story comes down to us from Wog's mate, Polly, a caveperson who carved it on a rock the day after she deciphered another of Wog's inventions —the alphabet.

Q. How did grass spread from its point of origin?
A. The seeds of the pot plant were transported by birds and beasts, water and wind. But the foremost . . .
Q. Are you telling us that Cannabis has almost conquered the world by means of the birdies, the beasties. The . . .?
A. I was about to say, you Hockey Puck, that its foremost agent of distribution was and is man. For 10,000 years Homo Sapiens and pot have been nearly inseparable.
Q. Where did the term "stoned" come from?
A. From Stonehenge, that prehistoric pile of rocks in England the Druids put together so they could tell the seasons of the year. The Druids found that after smoking a couple of joints, the weight of the immense rocks they carried on their backs didn't seem to bother them. One day when his mates saw "3-joint Percival" running across the moor with this particularly gigantic boulder, they said, "Man, you is really stoned." The phrase has stuck.

Q. You're putting us on, Grassman?
A. You'd better believe it.
Q. Hey, Grassman, that pot is one worthless plant, right?
A. Wrong. The white threads in the stem of the Mary Jane plant can be twisted together and made into a strong cord—a cool cord for fish nets, cloth, rope for ship's rigging—stuff like that. This product is called hemp.
Q. Anybody ever smoke a mizzen-mast rigging?
A. Sure, the crew of the "Flying Dutchman." Those guys are still floating.
Q. In that famous ghost ship?
A. Yes. About six feet off the deck. Stoned out of their minds.



Q. So those B.C. cats really dug pot?
A. Believe it man, believe it. The Neolithic Chinese considered pot a gift from the gods. They believed that Shen Nung, the divine cultivator, presented to them this miracle plant for their comfort and use: rope, cloth, fishnets, mats and—from the seeds that are rich in albumin and sugar—food. *Ta ma* they called it. "Great Hemp" Cannabis Sativa.

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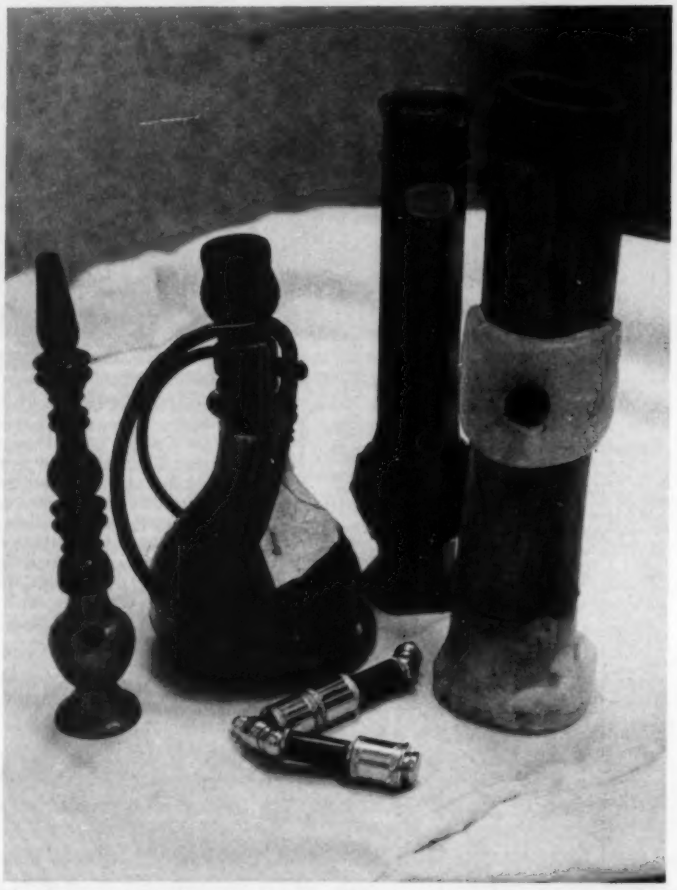

These are some "bongs," water pipes and hash pipes, used to smoke marijuana or hashish.

siderations in situations requiring sustained observations, such as driving, flying, and operation of industrial machinery." (Emphasis added)

In a survey of the research done on marijuana, Moskowitz also reports, "There is considerable evidence of a performance decrement (decrease) under marijuana when the subject is faced with stimuli which demand constant attention, which appear at random, unexpected intervals, or which require additional central processing such as storage and retrieval. Large performance decrements under marijuana have been found for conditions which require continuous attention. . . . Also, detection of intermittent random signals in either or both central and peripheral vision is impaired as is recognition of previously presented material."

Note the phrases "constant attention," "random, unexpected intervals," "conditions which require continuous attention," etc. Can you think of a skill which requires you to be able to handle these things *more* than driving a car? (Perhaps you can, but driving is certainly high on the list.) If you're driving stoned and your ability to handle unexpected hazards is reduced, what happens when some clown decides to jump into your lane very quickly, or when you find a piece of

AND HOW HIGH WAS HE?

There is some question about how widespread is the practice of driving while stoned. In California, the state Department of Justice, the Office of Traffic Safety and the California Highway Patrol have been cooperating on a study to answer this question. Be-

a two-by-four in your lane just after you round a curve? Maybe you'll be able to handle the situation, but you shouldn't stake your life on it.

Tracking: In an automobile, "tracking" means holding the car in its position within a traffic lane. "Pursuit tracking" is following something – lane markers, other cars, etc. – and it is a more complex function, involving visual perception, which we have already stated is impaired by marijuana.

In his literature survey entitled "Marijuana and Driving" Moskowitz says "There have been reports of performance decrements (decreases) on pursuit tracking tasks beginning at 5 mcg THC/kg B.W. (5 micrograms, or 5 millionths of a gram, of THC per kilogram of body weight). The greater sensitivity of pursuit tracking to marijuana may be related to the greater perceptual demands of such tasks in contrast to compensatory tracking. It should be noted that sensory-motor tasks involve both perceptual and motor demands and deficits can be due to impairment of either or both aspects." The amount of marijuana it is necessary to smoke to reach the level of 5 mcg THC/kg B.W. depends on the concentration of THC in the marijuana sample.

And that ain't all: These three areas may be the main ones affected by marijuana intoxication, but there are others. In one experiment, Moskowitz, Sharma and Dr. William H. McGlothlin found that **"peripheral vision is impaired progressively by increasing doses of marijuana** as shown by increased failure of light detections." (Emphasis added)

Sharma and Moskowitz studied the effects of marijuana on the "autokinetic effect," which they defined as "apparent motion of a stationary point of light in a darkened environment free of spatial references." They write:

"In this study we were primarily interested in the effects of marijuana on autokinesis in relation to such performance tasks as driving and flying. In this type of situation apparent motion of a stationary source of light has important implications concerning performance under drugged conditions. . . . The results provide objective evidence that visual autokinesis motion is substantially increased by marijuana. Moreover, **the increase in apparent motion is clearly dose-dependent.** (Emphasis added) This study estab-

continued

Or it's sometimes rolled into a cigarette or "joint." However it is used, the stuff spells trouble when combined with automobile driving.

gun in 1976, this study involved testing for THC in blood samples taken from drivers "subjectively judged to be intoxicated." Out of a total of 19,000 blood samples submitted by the CHP to certain laboratories for testing for alcohol content, about 1800 were randomly selected for the tests for THC.

The tests showed that 16 percent of the impaired drivers had THC in their blood. **For those between age 14 and 29, the percentage was 13 to 15; for drivers between 30 and 60 years, the figure was 19 percent.** The researchers suspected that these figures might be conservative, and that the actual incidence of marijuana use before driving might be much higher. One reason is that THC disappears rapidly from the blood. Also, any stoned driver who was stopped for suspected intoxication could choose breath or urine analysis and not be detected.

POT SHOTS

Q. What other early peoples used marijuana?

A. The Romans for one. They valued pot mainly because of the superior sailcloth they could manufacture from hemp (canvas = cannabis). The Carthaginians for another. A dab of hashish was found in the hull of one of their wrecked warships. The Anglo Saxons in England in Roman times cultivated pot. All those early dudes including the Vikings who introduced it to Iceland in the 13th century. There is even a remote possibility that Viking explorers brought grass seeds to North America.

G. How about now—A.D. 1979?

A. Grass is here, man. It is being grown. It is being harvested. It is being sold. It is being smoked . . . dang it!

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continued

Q. And how about you, Grassman? What is your current role as the age-old "Fearless Fighter of the Funny Fumes"?
A. My biggest concern is keeping pot-heads out from behind the wheels of automobiles.
Q. Grass and gas don't mix, eh? (chuckle, chuckle)
A. They do not. Hey, man, that's pretty good . . . "Grass and Gas don't mix . . ." (chuckle, chuckle)
Q. Shall we close out the interview on that note then?
A. Yeah, besides . . .
Q. Yes?
A. I see by my "Fearless Fighter of the Funny Fumes" wristwatch that it's time for me to zoom over to the club, unless . . .
Q. Unless?
A. Unless I wanta miss "Happy Hour."

lishes that smoking marijuana significantly increases the phenomenon of apparent visual motion. The results imply that hazards are involved in operating vehicles (driving or flying, for example) at night when under the influence of marijuana."

There have been a few studies performed using driving simulators and people under the influence of marijuana. One experiment by Rafaelsen, et al, compared the effects of alcohol with those of three levels of marijuana dosage. Moskowitz reports: "The two larger marijuana doses and the alcohol dose produced changes in the latency of response to the signal lights. Neither drug affected the mean speed. . . . Marijuana primarily produced a failure or delay in responding to signals from the environment rather than affecting the car control or tracking aspects."

Of his own study involving a simulator, Moskowitz concluded "Overall, the available evidence from the present and other relevant studies appears to indicate that any marijuana-related impairment of driving ability is more likely to be associated with perception and attention deficits than with the motor skills involved in car handling." Remember, though, that tracking involves visual perception.

The real thing: It could be argued that all the foregoing experiments cited are narrowly focused, and that the closest to actual driving are the ones done with simulators. Well, a study was done in 1974 on the effects of marijuana in real driving situations. The experiment was extensive and interesting, so we'll go into it in a little detail.

Dr. Harry Klonoff of the University of British Columbia performed the experiment with 64 volunteers on an artificial driving course and on city streets. The volunteers were given cigarettes with low amounts of THC, or with high amounts, or with the THC removed.

The driving course consisted of a slalom through cones, drives through tunnels, turns, backing and stops. The in-town driving was done in downtown Vancouver at various times between noon and 8:30 p.m. (For the safety of all involved, the cars were equipped with dual controls, and a researcher accompanied the volunteers on all drives.) The subjects were tested on their performance while driving straight on the course and in town. At another time, they were administered the cigarettes and then tested while driving stoned.

The criteria tested were general driving habits, cooperation, attitude, irritibility, judgment, speed, care while driving, confidence, tension, aggression and concentration.

When the results were examined, Klonoff discovered the marijuana had affected the drivers' judgment, care and concentration. He writes, "It is evident that the smoking of marijuana by human subjects does have a detrimental effect on their driving skills and performance in a restricted driving area, and that this effect is even greater under normal conditions of driving on city streets. . . . **Driving under the influence of marijuana should be avoided as much as should driving under the influence of alcohol.**" (Emphasis added)

That says it as well as we could.

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by
Col JOHN N. ELLIOTT,
USAF

YOUR BLIND SPOT

Everyone has a blind spot. In fact, everyone with the normal complement of two good eyes has a blind spot for each eye. This peculiarity, which can be clearly demonstrated, is caused by a "hole" in our vision where the optic nerve attaches to the retina at the rear of the eye. At that point there are no rods or cones and no vision. One does not notice this hole in his vision because the vision from one eye overlaps that of the other, and the brain completes the picture for us – be it a landscape, the road ahead, or whatever we are viewing.

You can check this out for yourself as follows:

Close your left eye and stare at the little girl at the bottom of the page. Hold the page about 10 inches in front of your face, but this will vary from person to person. Move the page closer to, or farther from, your face until the little boy on the right disappears. (If he doesn't disappear, you're not normal or you're doing it wrong.) Or you can close your right eye and stare at the boy and move the paper and see the girl disappear. The area of the blind spot gets larger as the distance between your eye and the scene increases, so that even a truck or a school bus could be hidden in your blind spot.

It is harder to demonstrate, but even with both eyes open, your nose can block the vision in your left or right eye, thus giving the same effect as closing one eye.

Thousands, and perhaps millions, of motorists have experienced this phenomenon at one time or another without realizing what has happened to them. For example: Have you ever stopped at an intersection (or given it the California stop) and pulled out in front of a vehicle approaching from the left or right that you did not see – even though you looked in both directions? If so, you have experienced, and have been the victim of, your blind spot. Your eyes were functioning properly and your brain completed the picture of the scene you saw, but what your eyes and brain didn't see was the vehicle in your blind spot.

While driving to work one morning, on Friday the 13th, in my bright yellow Volkswagen, I approached an intersection where a single vehicle with two people in it had stopped for the stop sign. I saw the driver look in my direction (I was approaching from his right). He then looked to his left and immediately began a left turn just as I was turning left into his street. (I had no stop sign.) He hit me broadside although I was driving a highly visible car. Fortunately, no one was hurt, and the first thing he said was, "I didn't see you." His wife, in the car with him, said she did see me and "couldn't believe it when he began to roll," but she froze and couldn't utter a sound.

Have you ever stopped at an intersection, looked both ways, turned left or right, only to look in your rear view mirror and see a vehicle behind you that "wasn't there before"? If so, you probably were the victim of your blind spot. I have talked to hundreds of people about this phenomenon and have heard hundreds of similar stories. Fortunately, not all of them resulted in accidents; but many of them did and still do.

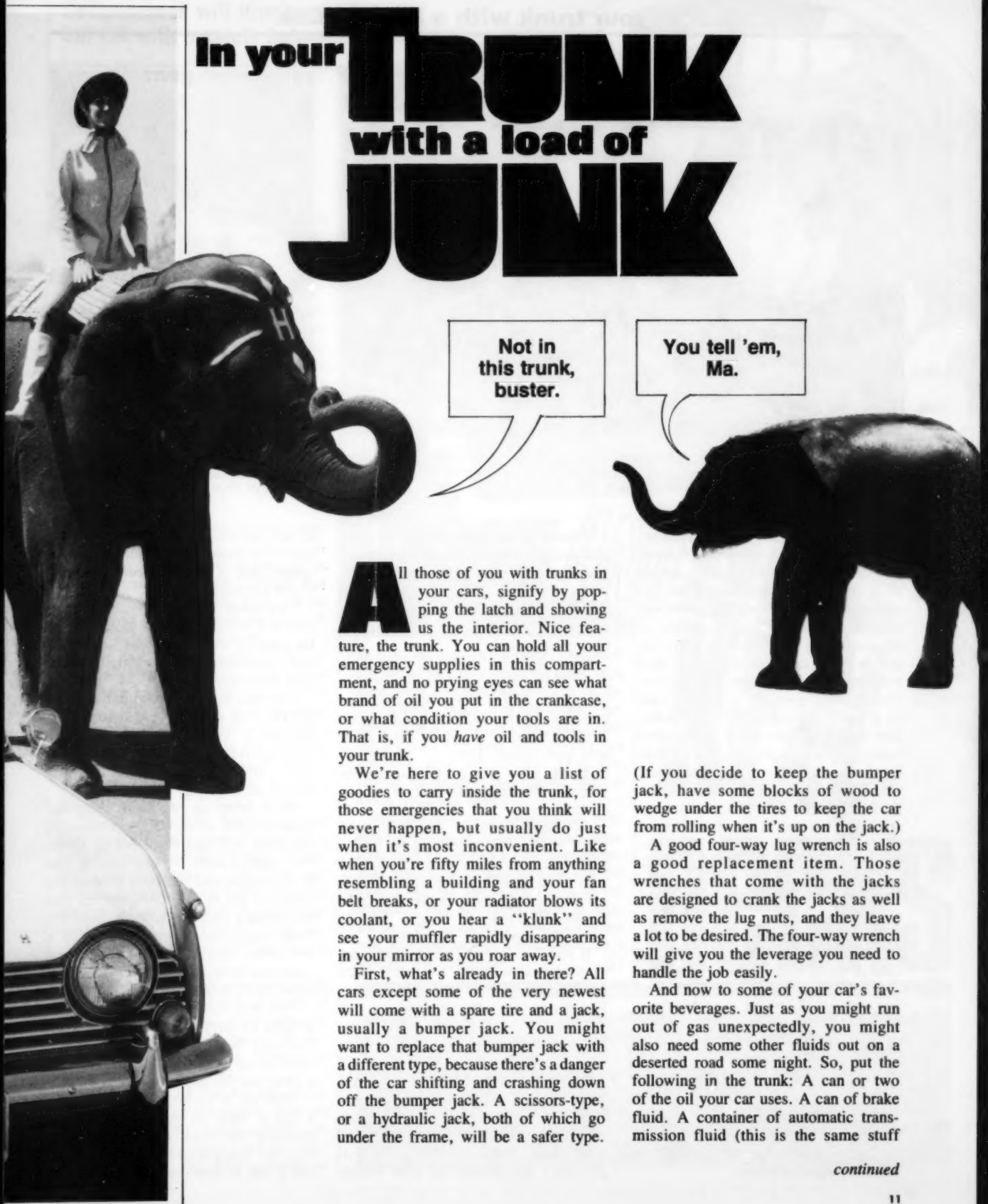
There is a simple cure for the blind spot problem. At intersections, you should turn your head left and right sufficiently to insure that your nose doesn't block the vision of either eye (due to the varying size of noses, some people will have to turn their heads further than others). Another recommendation is to look twice in both directions. By doing this, the vehicle that might have been in your blind spot will have moved out of your blind spot on your second look.

I'll wager that this article clears up many mysteries for victims of the blind spot, but most of all I hope it makes people aware of this little handicap and causes them to compensate for it. If nothing else, perhaps it will remind you that rolling through stop signs is not the smart thing to do.

Speaking of blind spots . . .
your trunk shouldn't be one either

Here it is, all laid out for you, complete with a handy beat-up cardboard box to hold it in. One more thing you might think of adding is a shovel.

In your TRUNK with a load of JUNK



All those of you with trunks in your cars, signify by popping the latch and showing us the interior. Nice feature, the trunk. You can hold all your emergency supplies in this compartment, and no prying eyes can see what brand of oil you put in the crankcase, or what condition your tools are in. That is, if you *have* oil and tools in your trunk.

We're here to give you a list of goodies to carry inside the trunk, for those emergencies that you think will never happen, but usually do just when it's most inconvenient. Like when you're fifty miles from anything resembling a building and your fan belt breaks, or your radiator blows its coolant, or you hear a "klunk" and see your muffler rapidly disappearing in your mirror as you roar away.

First, what's already in there? All cars except some of the very newest will come with a spare tire and a jack, usually a bumper jack. You might want to replace that bumper jack with a different type, because there's a danger of the car shifting and crashing down off the bumper jack. A scissors-type, or a hydraulic jack, both of which go under the frame, will be a safer type. (If you decide to keep the bumper jack, have some blocks of wood to wedge under the tires to keep the car from rolling when it's up on the jack.)

A good four-way lug wrench is also a good replacement item. Those wrenches that come with the jacks are designed to crank the jacks as well as remove the lug nuts, and they leave a lot to be desired. The four-way wrench will give you the leverage you need to handle the job easily.

And now to some of your car's favorite beverages. Just as you might run out of gas unexpectedly, you might also need some other fluids out on a deserted road some night. So, put the following in the trunk: A can or two of the oil your car uses. A can of brake fluid. A container of automatic transmission fluid (this is the same stuff

continued

See? What seemed like a whole boatload of tools and parts doesn't take up that much space, even in a small trunk like this one in a little foreign subcompact. With a little effort, you could probably arrange it even more compactly than shown here. We dare ya.

Maps, a flashlight and stuff like that go in the glove compartment. And your fire extinguisher should be mounted under the dashboard, not placed in the trunk with all that other stuff.

that goes in the power steering system).

Quick repair jobs will be much easier if you have a few basic tools stowed away back there. The minimum you should carry are a pair of pliers, an adjustable wrench and a couple of different-sized screwdrivers. In addition to these, carry a roll of silver duct tape and a length of some kind of wire. The tape can temporarily patch a hole in a hose or insulate a battery cable. The wire can serve many needs, from holding up a dragging muffler to making temporary electrical connections. Our Technical Editor personally favors the kind of wire used to hook up stereo speakers, because it has two separate wires, and it's insulated. However, this type of wire isn't suitable for automotive electrical use, so a length of 10- or 12-gauge wire is also a nice thing to have along.

How about seeing while you're working? That'd be kinda nice, wouldn't it? One of those little trouble lights that hooks into your cigarette lighter, or just a simple flashlight, will illuminate the recesses of your engine compartment.

And while we're on *seeing*, let's take up being seen. Other drivers need to see you when you're stopped in order to avoid hitting you, or to offer assistance, if they're nice enough to do that. Get a couple of signal flares or some bright reflectors.

If someone *is* nice enough to stop and your problem is just a weak battery, you can take care of it simply with jumper cables. (Make sure you know how to use these things correctly or you can shock yourself, or even cause the battery to explode.)

Now for parts: Do you have an extra fanbelt? It's surprising how few people carry one. But did you realize these cousins to the rubber band *never* break in town when you're close to an auto parts store? They are guaranteed to break when you're halfway to the slopes with the trunk full of skiing equipment.

And then there are the windshield wiper blades. The rubber on the blades will wear out even if they aren't used a lot. Heat from the sun in summer will eventually turn them brittle and little pieces will break off, causing them to smear the windshield, not clear it.

If you live in the climates with a lot of winter snow, there are a few extra items you'll want for that time of year. For de-crusting the windows, you'll need an ice scraper. The kind with the brush at the end of the handle is the best.

Another couple of things will aid you in getting out of snowdrifts, if you should be so careless as to drive into one. These are a shovel (obviously) and kitty litter. Kitty litter? Yes. It will provide a dry surface for your wheels as well as sand or salt, but it is much easier to clean up in the trunk, it's cheap, and it smells nicer (but only if you use *fresh* litter).

Two small items that will fit easily into any tool box are a tread gauge, for judging when you need new tires, and a pressure gauge, for judging when your tires need new air.

One final item for your trunk – a first aid kit. This could save you some discomfort if you cut or burn yourself working on the engine, and it might even save a life after an accident. A small kit will be sufficient for your needs.

We'll bring up one more thing because people sometimes put them in the trunk and they don't belong there: fire extinguishers. If you have a fire in the engine and you have to open the trunk to get at the extinguisher, you are wasting precious seconds. And the trunk might just be smashed shut in a rear-ender. Have the thing mounted under the dash on the passenger's side of the car. It'll be much more accessible.

You may think that's a lot of stuff to have to carry around, but you'll be surprised how little space is actually taken up in your trunk. All it takes is a little flair for packing.

After all, it's a lot better than getting a flat at night on the Mojave Desert, opening the trunk and finding only two old newspapers, one tennis shoe, and a box of stale Saltines.

Cobblestones will break your bones . . . but not with a safety helmet

anti-helmet people seem to hear what they want to hear. Well, most of us do when the issue is an emotional one. And helmets surely are an emotional issue.

We often get letters from motorcycle riders who claim that a helmet will cause death in an accident by breaking the wearer's neck. Some even quote "authorities" on the subject. This always leaves us with a cold feeling, because we have never been able to find a medical doctor who believes a helmet can break the neck of a rider who would have survived if he hadn't been wearing it. Believe us, we've tried.

Recently we got a letter from a member who had a serious accident—no helmet, of course—and wound up in an emergency room. He claimed that the doctor who cared for him said he would have died from a broken neck if he had been wearing a helmet.

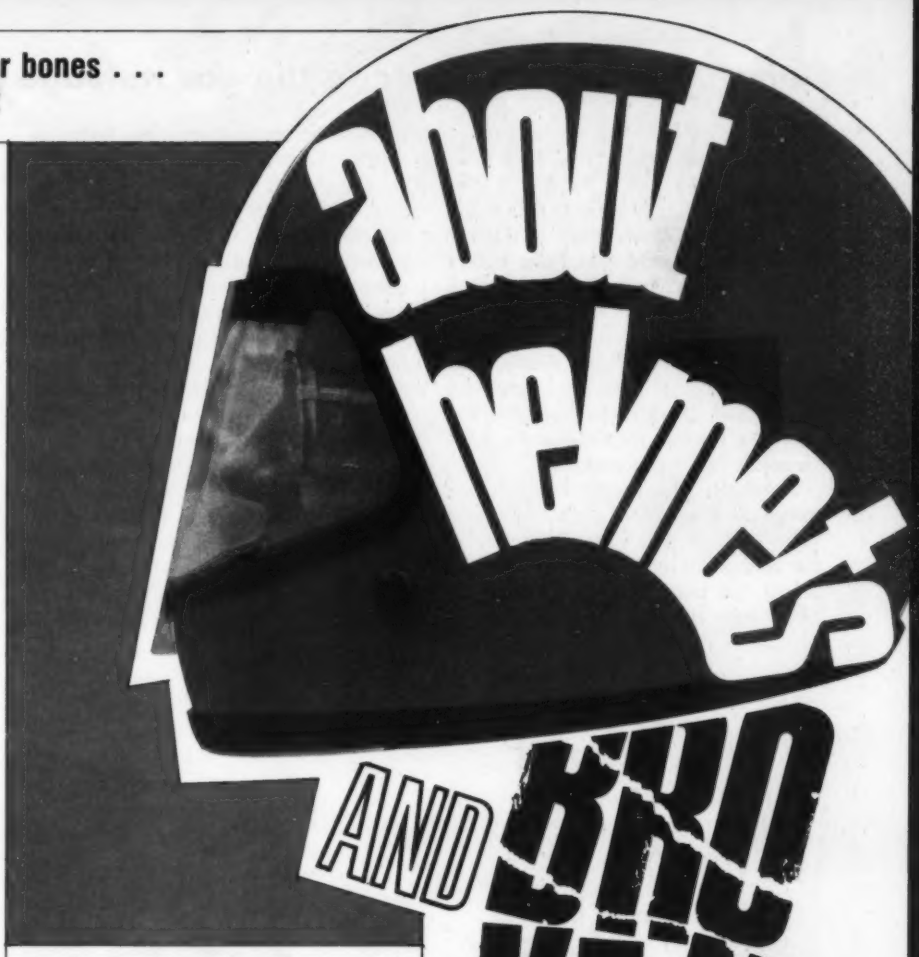
Now, our past experience told us that no physician or surgeon would make such a statement. But we checked anyway. We were able to track down the doctor who attended our correspondent while he was in the hospital as the result of a high-speed motorcycle accident. Here is the doctor's signed statement:

"I feel that helmet wearing should be mandatory and anyone that rides without one is basically an idiot. I have seen repetitive injuries to the head and serious injuries which have occurred without the use of the helmet, and many times where a fractured helmet occurred in the accident without injury to the patient.

"I question whether it is an actual right for a motorcycle rider to put himself to the extra hazard of not wearing a helmet when society has to be responsible for the extreme expense of the results of the accident."

Those are strong words, but we've heard stronger from other doctors we've talked with on the subject. So far as mandatory helmet laws are concerned, it's not DRIVER's business to take one side or the other. Our readers are service members and know they must wear a helmet while riding on the installation. What they do outside the gates is up to them. We hope that if you are a cyclist you wear your helmet, not because your commander says you should but because you realize you are much better off with it.

We are perfectly willing to hear other opinions on this matter, but opinions must be backed up by knowledgeable people, scientific studies and the like. Until we get some proof to the contrary, and we doubt there is any, we feel we must warn you: If anyone tells you your helmet will kill you, he's feeding you nonsense.



about helmets AND BROKEN necks

Detroit's new/old answer to the gas mileage problem

You've all seen the ads . . . NEW!!! TURBO-CHARGED!!! THE '79 BU-STANG TURBO-SPORTS COUPE!!! Well, as much as Detroit would like to have you believe they invented turbocharging and have put it on the new cars especially for you, it's a fact that turbocharging has been around for quite a while. Aircraft and industrial engines have used turbos for years, and the high-performance car and boat crowd aren't exactly newcomers to the scene either.

However, what *is* new is the *reason* turbos are becoming popular, the reason turbocharging will play a big role in the automobile of the near future. In a word, that reason is *economy*. That's right, turbocharging, once thought of in high-performance terms only, is rapidly becoming the easiest and cheapest way to fuel economy!

Today, turbochargers are prized for their ability to extract maximum power from small, fuel-efficient engines. The small engines are necessary because of the new government-mandated mileage standards. The manufacturers cut the weight of their cars, and down-sized them, but they still needed a third ingredient to complete the high-mileage formula. That third ingredient is the small engine. Unfortunately, these little engines don't make an awful lot of power in the stock state, and people weren't exactly flocking to buy them, so turbocharger-induced extra power was the answer. Manufacturers also figured out that if you could make a little engine propel a medium-sized car, mileage could be even better . . . again, turbo-power was the answer.

We'll probably be seeing more and more turbocharger-equipped cars as mileage requirements become even stiffer, so why not read along and get familiar with the device that helps Detroit (and you) solve the "mileage vs power" problem.

First, engine basics: The standard Detroit automobile engine is a four-cycle (stroke), spark-ignition engine with four, six, or eight cylinders, and is "normally aspirated." Normally aspirated means it breathes air, just like a human does, at atmospheric pressure. The only way air gets into the engine is because air has weight, or density, caused by the weight of the air in the atmosphere pushing down on the air at sea level. The four-cycle engine has pistons that "pump" air into themselves, just like your lungs do when you breathe in. Actually, the pistons (and your lungs) create a vacuum which is filled by air rushing in under atmospheric pressure.

Unfortunately, in an engine the volume of air that goes into a cylinder

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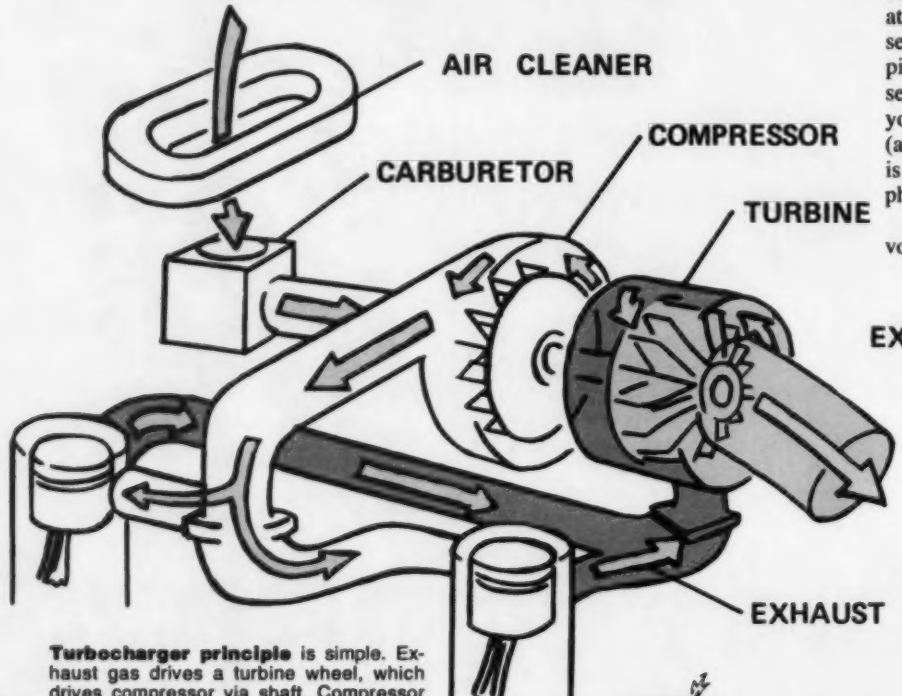
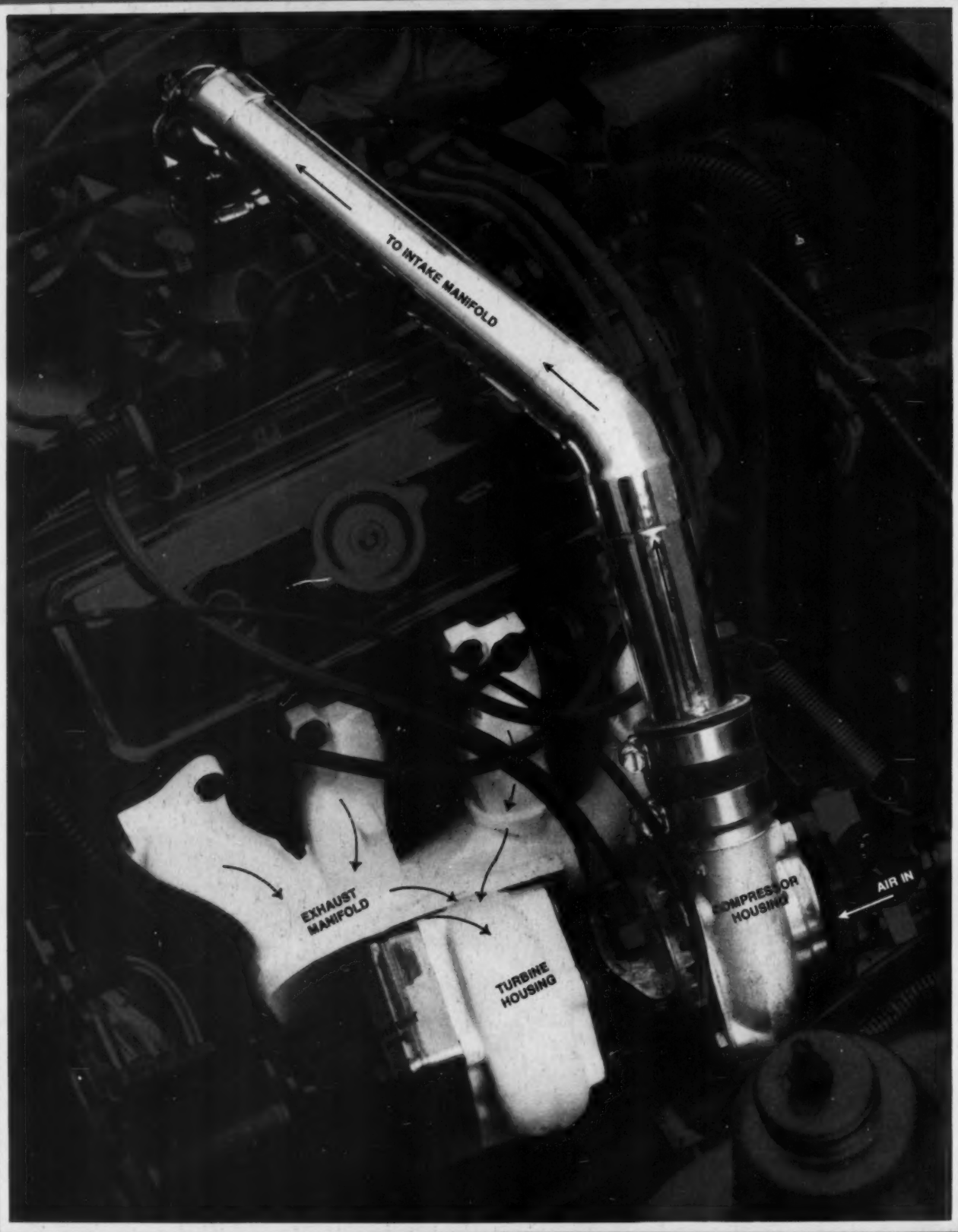


Turbocharger principle is simple. Exhaust gas drives a turbine wheel, which drives compressor via shaft. Compressor forces air into engine, making more power.

Mustang Turbo-Cobra 4-cylinder engine is small, 2.3 litres, but powerful. It's helped by the four-speed transmission and 3:45 rear axle ratio.

Buick Riviera S-Type has turbo-equipped engine. Better gas mileage results when small engines are powerful enough to motivate medium-size cars.

'79 Buick Century Custom Coupe is a good example of how to use a small but powerful turbocharged engine to move a good-sized car. Better gas mileage is the result. Saab, Mercedes and Porsche also offer turbo-cars.


TO INTAKE MANIFOLD
EXHAUST MANIFOLD
TURBINE HOUSING
COMPRESSOR HOUSING
AIR IN

continued

isn't the same as the volume of the cylinder . . . it's less. This inequality is caused by: a slight pressure drop through the carburetor, restriction to air flow caused by the intake port and valve, the inability of the piston to expel *all* the spent gases after the combustion stroke, and flow restrictions caused by the exhaust valve, port, and exhaust pipe. An ordinary engine will flow only about 80% of its actual cylinder volume.

But what if we could get the cylinders charged with all the air they could hold? That would mean that there is more air/fuel mixture in the cylinder than under normal conditions. Therefore, the same cylinder would produce more horsepower. And if a straight 1:1 ratio of content-to-volume is good, then wouldn't a 2- or 3-, or even 5:1 content-to-volume ratio be even better?

So, we know what we need is, in essence, a big air pump, to *force* in the air/fuel mixture. That's fine, but how do we drive this pump?

Turbo vs supercharger: There are basically two types of air pumps, or devices that "charge" a cylinder with more than its normal amount of air/fuel mixture. These two pumps (or air compressors) are called turbochargers and superchargers. Superchargers are usually positive-displacement type compressors, and turbochargers are the centrifugal type.

Positive displacement compressors are those with some form of piston that actually compresses the air by direct mechanical action. They are quite good at compressing air, but since they are so good at their job, they need a large power source to turn them. This type of compressor, the supercharger, is normally driven by a belt or chain which is connected directly to the engine crankshaft. The engine gets a lot of power with a supercharger, but it *uses up* a lot of the extra power in just running the compressor. If you make, for instance, 100 extra horsepower with a supercharger, and you use up 70 of those horsepower in just running the device, you've only got a net gain of 30 horsepower. If you add to this the problems involved with the mechanical drive components, the actual size of the supercharger with all its pistons (or lobes, or rotors, depending on the type of compressor), and the inherent large cost of the whole system, you get a rig that's doomed to competition or industrial use only.

"Aha," you say, "what about a turbo . . . don't the same problem apply?" Nope, and that's what makes the turbo the first choice for production automotive application.

How it works: Turbocharging is simply the process of using otherwise wasted exhaust gas to run a small air pump. A turbine wheel is installed in the exhaust system and is connected by a shaft to an impeller (compressor) mounted near the carburetor.

During normal, steady driving, the exhaust gas doesn't have a lot of ve-

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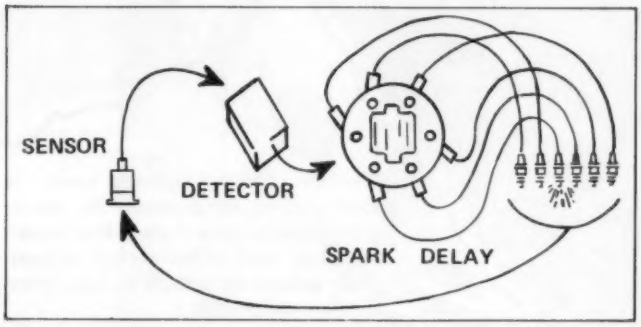
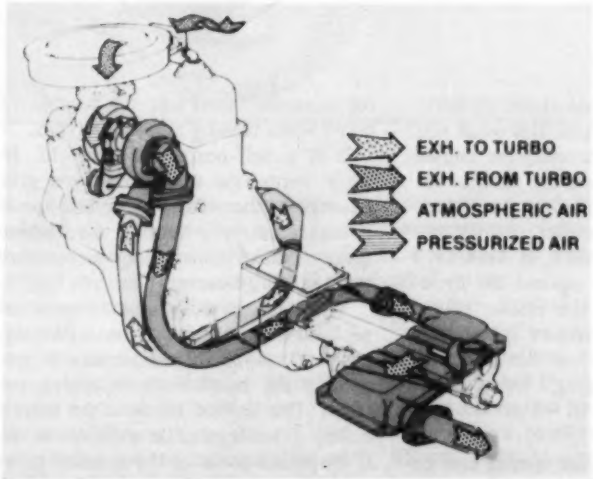
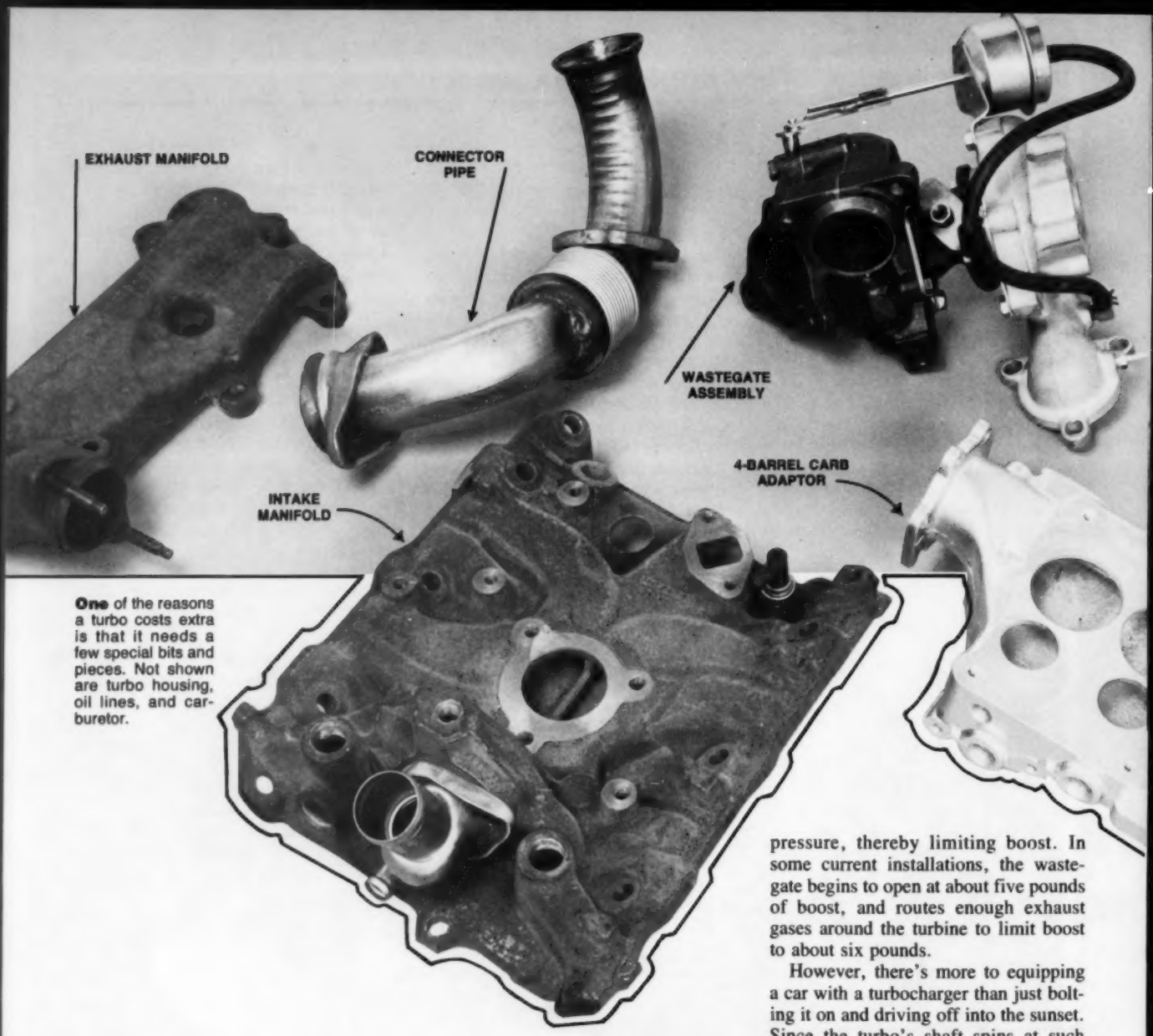


In order to prevent engine damage due to detonation (knock), some turbo-equipped engines use sound sensors located in, or under, the intake manifold. When they "hear" engine knock, they signal a control module to delay, or retard, the ignition timing. Other spark-retard mechanisms are triggered by specific boost levels (see text).

(left)
Experimental Chevette turbocharged, fuel-injected engine. Placement of turbo close to exhaust manifold lessens "turbo lag" caused by long pipe runs between exhaust manifold and turbo. Most factory setups don't enjoy this luxury because of space limitations in the engine compartment.



Overview of turbocharger system shows exhaust flow. After powering the turbo, exhaust is routed through catalytic converter and out exhaust system in the regular manner.



One of the reasons a turbo costs extra is that it needs a few special bits and pieces. Not shown are turbo housing, oil lines, and carburetor.

locity, and the turbine speed is fairly low, around 20,000 rpm. But when you step down on the throttle, the engine speeds up, and so does the flow of exhaust gas. This accelerates the turbine and, in turn, the impeller. As the impeller speed increases, it creates a positive air pressure against the cylinders so that when the intake valves open, an air/fuel mixture is rammed into the cylinder. Since this is known technically as "charging" the cylinder, and the turbine does it, we get the term turbocharger.

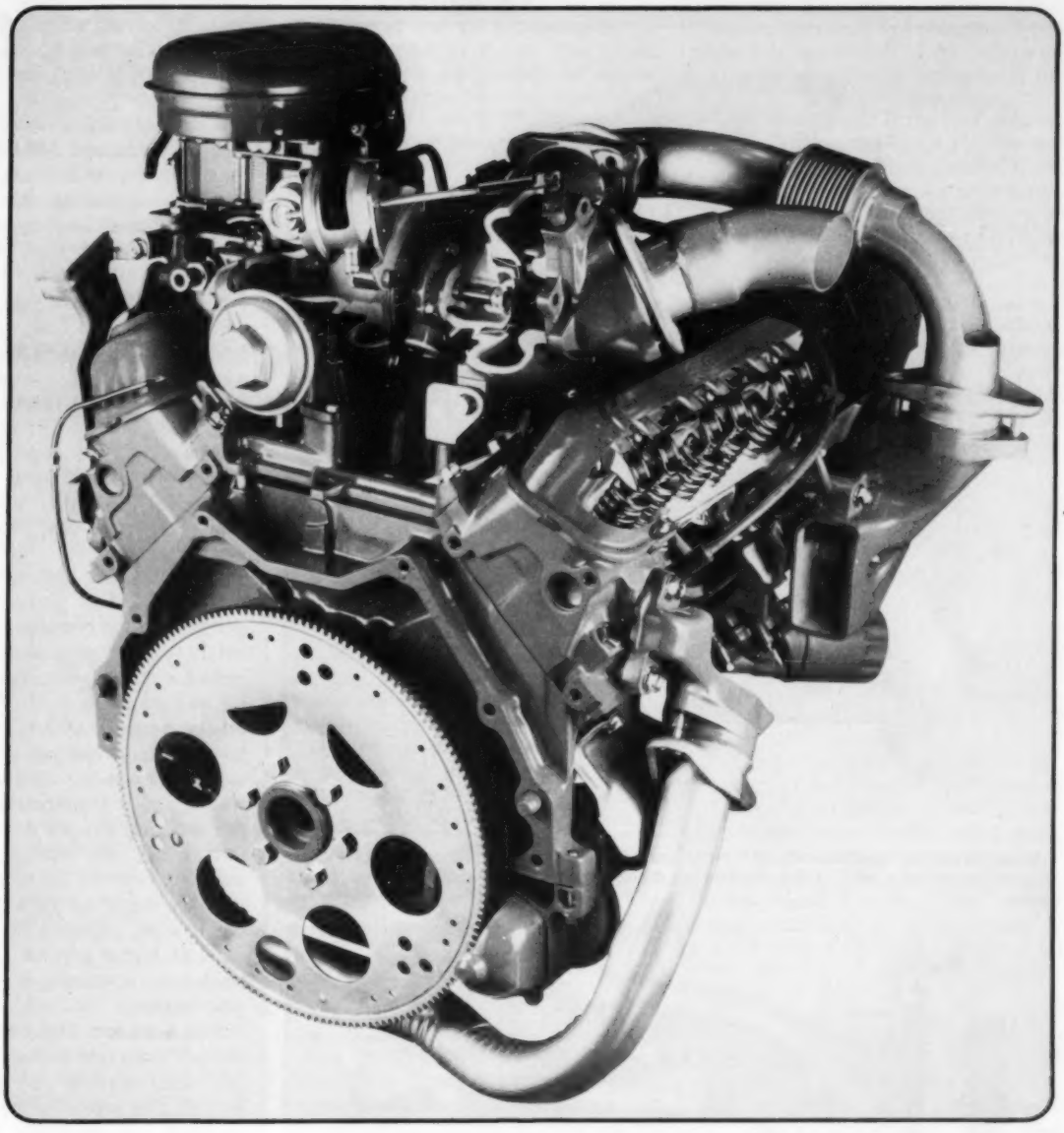
Turbine and impeller speeds can go quite high. Ford's turbo-Mustang, for instance, generates six pounds of boost when turning at 140,000 rpm!

It is a self-perpetuating cycle. In other words, the more boost you give an engine, the more power and speed it makes, thereby turning the turbine faster to make more boost which makes more power, etc., etc.

You will obviously reach a point of no return and the engine will self-destruct . . . so we need a way of preventing the boost from becoming too high. The device used to do this is called a wastegate, or exhaust valve. It by-passes some of the exhaust gases *around* the turbine at a predetermined pressure, thereby limiting boost. In some current installations, the wastegate begins to open at about five pounds of boost, and routes enough exhaust gases around the turbine to limit boost to about six pounds.

However, there's more to equipping a car with a turbocharger than just bolting it on and driving off into the sunset. Since the turbo's shaft spins at such high speed and is subjected to the high temperatures of exhaust gases, it needs a good oil supply to keep its bearings alive and well. The engine is the source of this oil. If engine oil temp exceeds a certain level, or if engine oil pressure falls below an acceptable limit, you need some type of warning device to tell the driver that his turbo is about to go out to lunch. Most cars that are equipped with factory-installed turbos have a warning light or audible signal for this purpose.

Another facet of turbocharged engines is that combustion chamber temperatures tend to run much higher than in a normally-aspirated engine. These



high cylinder temperatures can result in detonation, or knock, that can damage pistons or connecting rods if ignition timing is not retarded.

The new Capri and Mustang turbos, for instance, use two built-in ignition retard points in their electronic ignition setups. At about one pound of boost, a switch in the intake manifold sends a signal to the ignition module which then retards the timing six degrees. And at four pounds of boost, another manifold switch signals for six more degrees of retard from the module.

Because of higher cylinder head loads and stresses imposed by the extra power generated by the turbo, most engines require some modification. Among the items that may have to be replaced with heavy-duty or competition-rated parts are the head gasket, the main and rod bearings, the oil and water pumps, and the radiator. The oil pump in particular, since it must supply both engine *and* turbo needs, must have greater volume and pressure than a stock item, as well as stiffer pressure relief springs.

Factory turboed engines also have improved valve stem seals, and the valves themselves are specially made items required by the loads and temperatures imposed by the turbo.

Care and feeding: In many instances, turbocharging seems to be the answer to the economy VS power prob-

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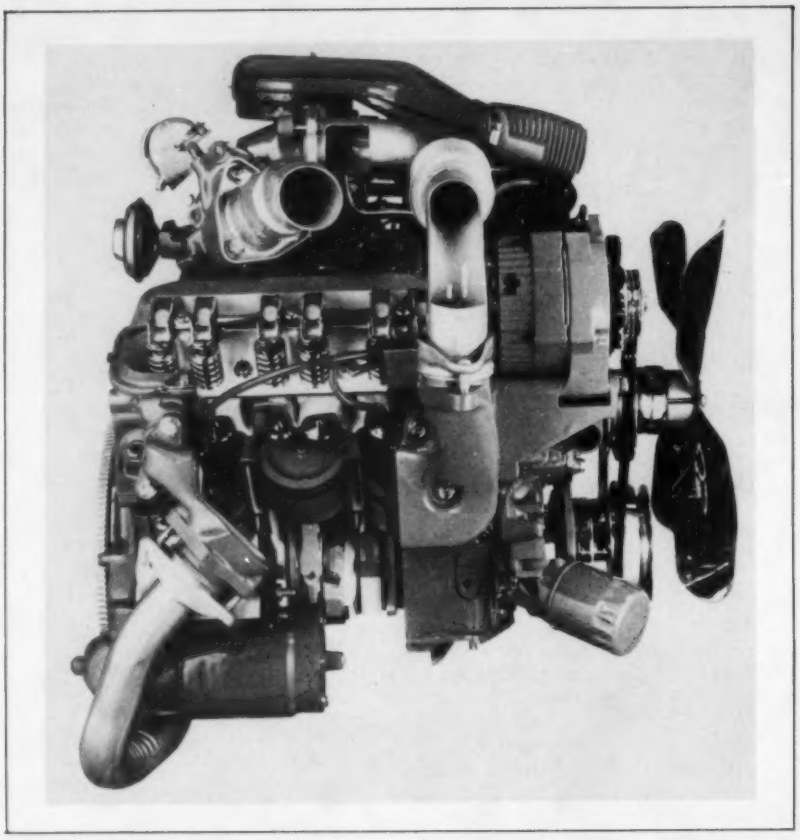
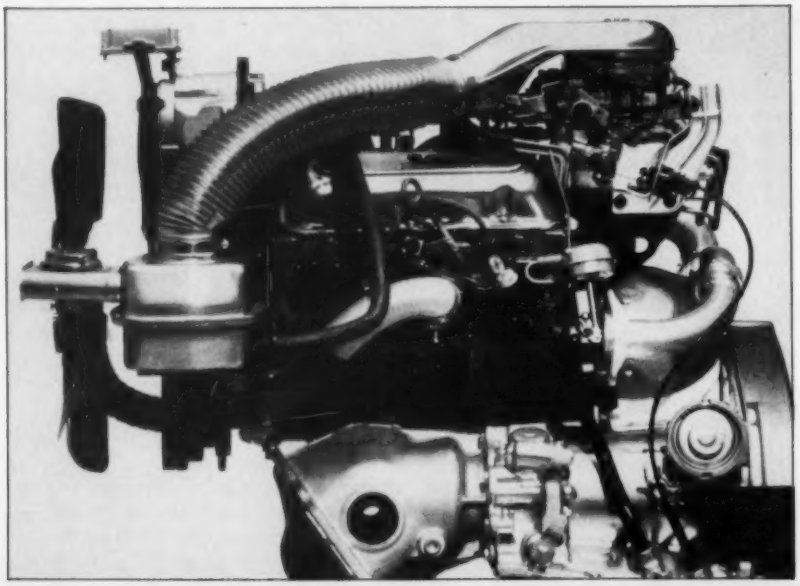


Turbo-mounting location doesn't make carb adjustments any easier, but don't worry, non-adjustable carbs are just over the horizon, thanks to new government emissions requirements.



Riviera turbo location differs from Mustang and regular Buick because engine sits lower and slightly offset in frame thanks to the Riv's front-wheel-drive components.

lem. However, these critters need a bit of special care and feeding if they are to provide long, troublefree service.

Remember that a turbo's shaft speed can get up around 140,000 rpm. That means that proper lubrication of the bearings supporting that shaft is essential. If those bearings seize, or self-destruct in some way, it'll cost you about $50 to rebuild it yourself, and around $250 to have your friendly mechanic do it. The best way to prevent this mini-disaster is to keep your turbo on a steady diet of clean air (by changing the air filter religiously) and clean, top-quality oil.

Since the turbo requires a constant supply of clean oil, you may have to change oil a bit more often than your non-turbo-equipped buddy has to. Contributing to the clean-oil problem is the fact that, although the turbine unit is sealed to prevent gases from getting into the bearings, there is some small leakage past the seals. These leaked exhaust gases contaminate the oil, so a good rule of thumb is to change oil about every 3,000 miles, and change the oil filter when you change the oil.

You also need to make sure the wastegate and spark-retard controls are working properly. On the Fords and Buicks, the wastegate is external and accessible and can be easily checked with a compressed air source. Remember though, adjusting the wastegate to open at higher pressure will not only void your warranty, it can also void your engine.

The answer? Right now, the turbocharger is the best way we have of making small-engined cars perform with any kind of vigor. In the future, we'll probably see electronic fuel injection added to the system for an even better mileage rating. However, with the government's mileage mandates for 1985 and beyond, we may have to get used to our future cars operating with alternate fuels such as hydrogen or gasohol. We'll also have to face the very real possibility that even turbos won't help in the mileage race and that much smaller cars and engines will be the ultimate answer.

But for the present, turbos are right in the thick of things, so you might as well get to know them . . . chances are you'll have one on your next small car!

Timely Topics

HOW'S YOUR BRAKE FLUID?

A study made by the German Auto Club and reported in the November 1978 *Motor Trend* magazine revealed that 72% of the cars it tested were either low on brake fluid or had fluid so old it was no longer fully effective. A German brake manufacturer, ATE, says disc temperatures can reach 400 degrees centigrade without adversely affecting brake fluid, but at 700 degrees, common under hard mountain driving, the boiling resistance of the fluid is reduced. It is recommended that the fluid be changed after prolonged driving under severe conditions, or at least once a year under normal driving conditions.

On the plus side for the German drivers, 72% of the group tested were found to keep their discs in good shape.

ALL NEW "4x4" SERIES 9 . . .

Joins Chevrolet's mini-pickup LUV line for 1979. The new parttime 4-wheel drive LUV is available as a short-wheelbase (102.4 inch) model only, with a 73-inch box, 38 cubic feet of cargo space and gross vehicle weight of 3,750 pounds. Its 110.8 cubic inch, 4-cylinder engine, rated at 80 horsepower, powers all LUV models. Modifications to the exhaust gas recirculation and carburetion systems, plus new outside air ducts, improve fuel economy and aid the catalytic converter in complying with new light-duty truck emission standards. The 4-wheel drive LUV sports a new front fender emblem and the optional sport decal package. LUV is also available in the conventional 2-wheel drive series in both short- and long-wheelbase models.

CONCRETE MEDIANS SAVE

Contoured concrete median barriers are soaring in popularity because they are saving lives. Some 2,700 miles of them have been installed on U.S. freeways in the past few years and more are going in, replacing post-and-rail guards. In a 17-month study in Michigan, 6,000 accidents involved guardrails of all kinds. Sixty-six resulted in fatalities, all from hitting steel barriers. With the new barriers, the contoured walls tend to return the car to the road surface, rather than having it crash through the steel and into oncoming lanes.

KEEP THOSE TIRES INFLATED PROPERLY

Don't forget that as temperatures get colder the inflation of your tires drops, too. If you put 28 pounds per square inch of air in your tires on a warm afternoon when it's about 80°, the tires will have only 24 psi when the thermometer drops to 40°. A lot of drivers who check their tires faithfully during summer aren't so careful about it in the winter. Use your own hand pressure gauge if you have one, and check the tires when they are cold. The car should have been parked for at least three hours. If you have to check inflation at a service station, you can drive up to a mile from home to station and still get an accurate reading.

OCCUPANT PROTECTION STANDARDS TO BE EXTENDED TO TRUCKS, VANS

Occupant protection required in passenger cars would be extended to drivers and passengers of light trucks, buses, and multipurpose vehicles under rulemaking proposed by the National Highway Traffic Safety Administration (NHTSA). The proposed rule changes would require combination lap and shoulder belts, safer steering assemblies, and interior padding in these vehicles to reduce crash hazards.

The proposed rulemaking would extend occupant protection standards FMVSS 201, 203 and 204 to light trucks and multipurpose vehicles such as vans. Petitions to extend the occupant safety standards were filed by the Insurance Institute for Highway Safety and the Center for Auto Safety late last year.

Under the proposal, lap and shoulder belts would be required for the front outboard seating positions. Currently, lap and shoulder belts are standard equipment in Ford and Volkswagen vans, while General Motors and Chrysler offer them as options, a NHTSA spokesman said.

FMVSS 201 would require padding on arm rests, seat backs, dashboards, and sunvisors. Standard 203 requires energy-absorbing steering assemblies to meet a 15 mph frontal crash test. Under standard 204, the steering column may not move to the rear more than five inches in a 30 mph frontal impact.

NHTSA-SPONSORED FELLOWSHIPS FOR TRAFFIC SAFETY PROGRAM MANAGEMENT

Under NHTSA sponsorship, Indiana University's School of Public and Environmental Affairs has eighteen $6,000 fellowship/internship stipends for its *Traffic Safety Program Management* emphasis within the Master of Public Affairs (MPA) Program.

Although the program is aimed at providing graduate education to in-service (state and local government) personnel, any individual who has a bachelor's degree and can demonstrate a commitment to the field of traffic safety is encouraged to apply. Those accepting stipends must agree to attempt to pursue employment in the field of traffic safety for at least three years following graduation.

The stipend may be used to cover tuition as well as books, supplies and other living expenses. Total tuition for the 48-credit hour program is approximately $4,300 for out-of-state students and approximately $1,800 for in-state students. A limited number of work-study and other financial aid programs are available to students who qualify for them, and often positions for spouses can be found.

Inquiries should be directed to Professor John R. Gordon, School of Public and Environmental Affairs, Indiana University, 400 East Seventh Street, Bloomington, IN 47401 (telephone: 812/337-3908), or Dr. William E. Tarrants, Manpower Development Division, National Highway Traffic Safety Administration, U.S. Department of Transportation Code NTS-22, Washington, D.C. 20590, phone: (202) 426-1634.

DOUBLE CLUTCH

continued from page 2

a spare. However, GM isn't ready to take this step yet.

Now Bridgestone Tire Co. has developed the "Pneuma Sensor." It was originally designed for heavy tires but the company says it is capable of being mounted on automobiles to monitor passenger tires. Bridgestone feels that their device is superior to the ones being developed in the United States because it is simple and uses the battery already in the car.

In addition to the pure safety factor involved in warning a driver of low tire pressure, early warning can mean that a tire could be repaired rather than discarded because of damage induced by running flat. Also, fuel economy is enhanced if the tire pressure is maintained because a properly inflated tire has less rolling resistance.

Will these devices add to the price of the car? Don't ask.

THE HOW AND WHY OF

filters

Servicing the various filters that your car uses is a rewarding job for two reasons: One, the actual job of servicing the filters (either cleaning or changing them) is really a simple job, and two, filter care is necessary to insure a normal service life for your car's mechanical components.

With the exception of the automatic transmission fluid filter and the power brake air filter, both of which do not appear on all cars, your car will always use three filters. They are the oil filter, the air filter, and the fuel filter.

Oil filter: Oil filters are necessary because one of the oil's primary functions is to clean internal engine surfaces. As the oil does its thing, the bits and pieces of junk removed from the engine have to go somewhere. Unless there is a filter in the system, these contaminants (both solid and chemical) stay in the oil and eventually go right back onto the surfaces inside the engine.

By using an oil filter, oil contaminants are trapped in the filter elements and do not go back into the engine. It's a good idea to change the oil filter each time you change the oil, because there isn't much sense in putting in four quarts of clean oil and leaving one dirty quart inside the filter. In less than five miles, the contaminated oil left in the unchanged filter will mix with the clean oil and you've defeated the purpose of the oil change.

In order to change the oil filter, you'll need an oil filter wrench, some form of vehicle lift, and vehicle supports. You'll need the lift and the supports to get to the filter because it is usually located underneath the engine and you'll need space to wriggle underneath the car and get at it. The need for vehicle support (jack stands) should be evident. You'll also need a 5-or 6-quart container for the oil you'll be draining out.

Even though some filters are accessible from the top of the car, remember the filter is being replaced as part of the oil change. The engine oil drain plug is always located under the car, so like we said, you'll need to have the car up in the air.

After jacking or lifting the car up far enough for you to get underneath comfortably, and after you've put the weight of the car squarely on the jackstands, remove the oil drain plug which is located on the engine's oil pan. For good, thorough draining, the oil should be hot, and a 15-minute drive prior to draining should work fine. Be careful though . . . 15 minutes of driving will make all engine parts, including the oil pan and drain plug, very hot.

After the oil has stopped flowing from the drain hole, the oil filter can be removed. Simply slip the special oil filter wrench around the filter cannister (as shown in the accompanying pictures) and apply pressure counterclockwise. Wrench safety rules dictate that you always pull a wrench, never push it. And remember, the filter, and the oil in it, will be very hot.

Lubricate the rubber gasket on the new filter with clean engine oil, and after oil has stopped draining from the filter mount on the engine block, install the new filter. Never tighten the new filter with the filter wrench . . . tighten it hand-tight only. If you tighten it with the wrench, you'll probably dent the outer layer of the filter and you will insure that after the filter has "set" onto the mount with engine heat, it'll be almost impossible to remove at the next oil change.

Reinstall the oil drain plug, refill with fresh oil, start the car and check for oil leaks, recheck oil level, and you're done. You can dispose of the old oil by simply taking it to a service station and pouring it in their drain-oil tank.

Some imported cars, and older GM products, have replaceable filter elements instead of actual cannisters or spin-on units. With this cartridge type, you must remove the cartridge container from the engine block, clean the container itself with safety solvent, and replace the cartridge. The long through-bolt that holds the container onto the engine will have one or more O-rings on it . . . check for tight fit and replace about every fourth oil

continued

The oil drain plug in the engine oil pan is accessible only from beneath the car. Remember that wrenches should be pulled, not pushed . . . saves the knuckles a lot of grief.

When removing the old oil filter, the oil filter wrench fits on only one way. If the wrench won't tighten up, remove it and flip it over.

Spin-on type oil filters have rubber or neoprene O-rings to effect an oil-tight seal. Check the seal on the new filter for cuts or nicks before you install it.

After checking seal condition, pre-lube the seal with clean oil.

The new oil filter should be installed hand-tight only. If you put it on with a filter wrench, it'll take powers that you probably don't possess to get it off!

Underneath this huge metal cover lurks an air filter . . . go ahead, remove the wing nut that holds the cover down.

Remove the cover and VOILA! There you see the top of the air filter . . .

continued

change. The container seats against a rubber seal inside the lip of the engine block mounting, and this seal should be replaced at every filter removal.

Air filter: This is really an easy one. On top of your engine you'll find a big piece that looks like a sewer cover (or a hubcap . . . smaller engines use smaller filters). In the center of this air filter housing there will be a wing nut (no jokes please) that holds the cover down. Just unscrew the wing nut, lift off the top of the filter housing, and remove the filter element. Install the new one after checking to see if it has any directions (like, "this side up" . . . some of them do) on it.

Some cars have three or four spring clips to hold the cover on, but that doesn't really make the job a lot more difficult, does it?

On a very few cars, the filter set-up can be a bit complicated. Cars equipped with fuel ejection or turbochargers can be like this, but your owner's manual will show you how to remove and replace the filter.

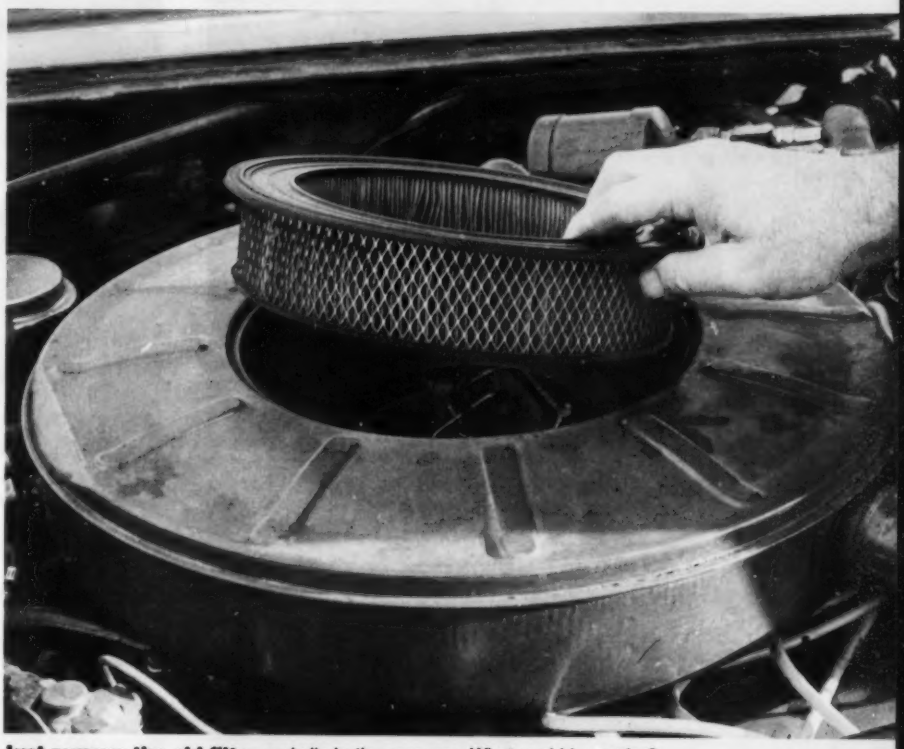
A small minority of cars are equipped with a cleanable foam air filter. Just gently remove the foam from its wire cage and soak it in safety solvent. Then, gently squeeze it, don't wring it out. Allow it to dry and then dunk it in clean engine oil. Again, gently squeeze out the excess oil, and refit it to the wire form.

After you lift off the filter cover, you may discover another, much smaller filter on the inside of the filter housing. This is to strain air going to a positive-crankcase-ventilation system. It slips in and out easily, and should be replaced at intervals specified in your owner's manual.

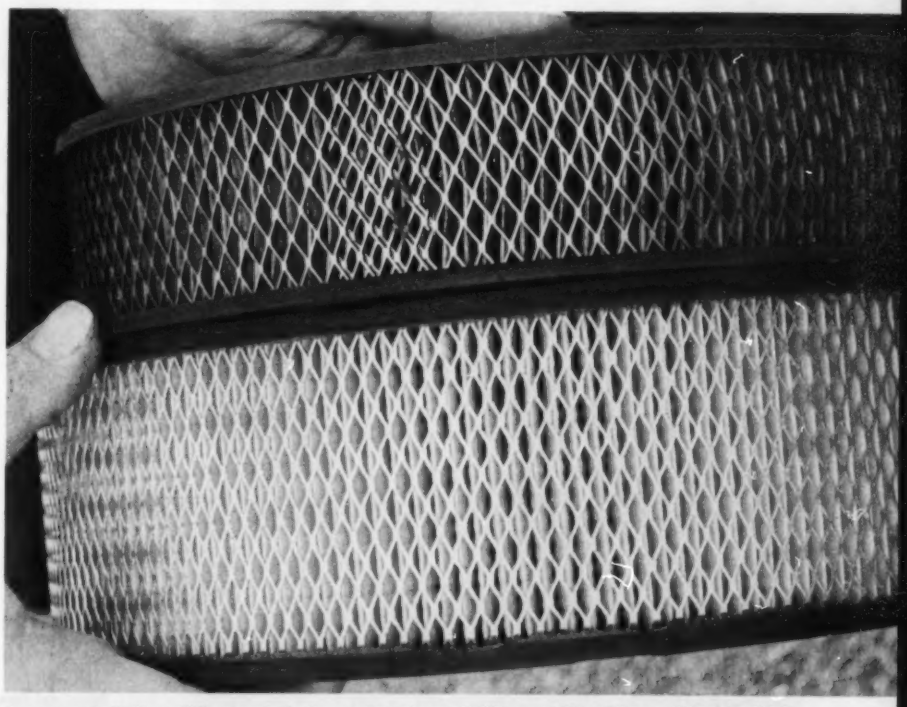
Gasoline filter: There are three types of fuel filters in use today: one is an element type mounted in or on the fuel pump; the second is a small plug of sintered bronze or pleated paper that fits into the carburetor fuel inlet boss, and the third is an in-line filter that mounts between the fuel pump and the carburetor.

The fuel pump type is replaced by simply unscrewing the cover (it may look like a mini oil filter), lifting out

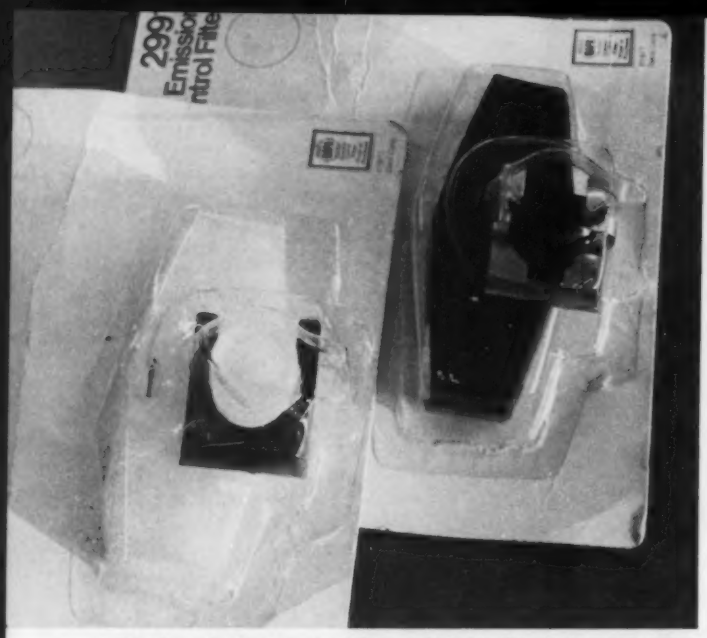
continued



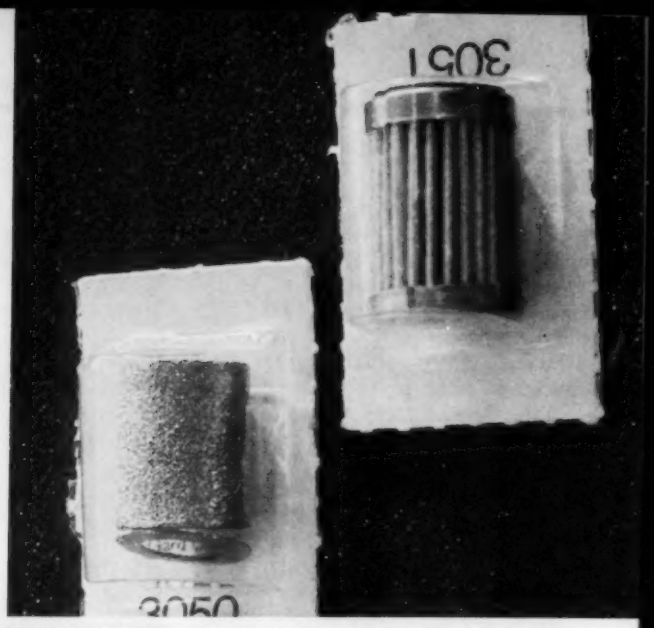
Just remove the old filter and slip in the new one. What could be easier?



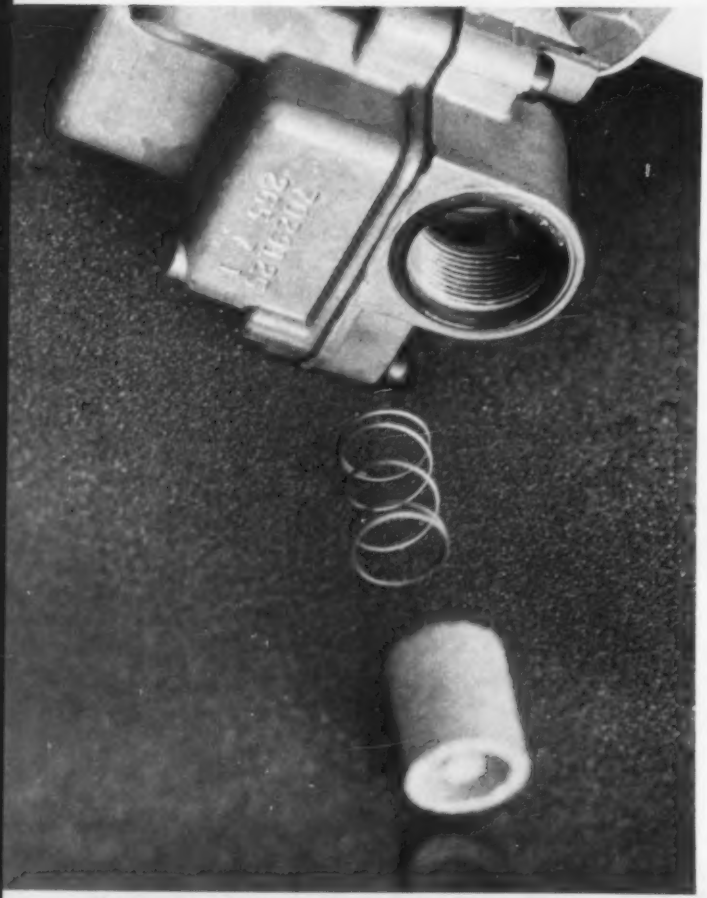
Can you tell the difference between the clean air filter and the dirty one? If you didn't have an air filter, all that yecch that the filter collected would be inside your engine, wearing things out!



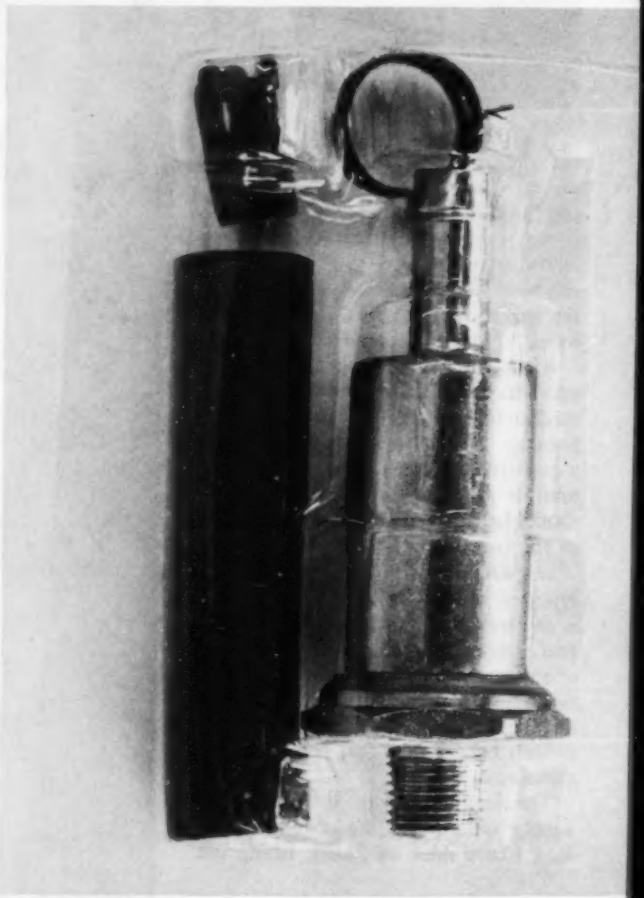
Small emission control filters fit inside the air cleaner housing. Not all cars have them, so check in your owner's manual to see if your car needs one, and how often it should be replaced if your car is so equipped.



Sintered bronze and pleated paper are just two of the different materials used for in-the-carburetor fuel filters.



In-carb filters have little springs to position them. If you get fumble-fingered, the little spring will occasionally fall somewhere down inside the big engine, where it will be eaten by a gremlin . . . do not drop the spring.



This type of fuel filter fits between the fuel line and the carb. It can be overtightened very easily, and you'll wind up buying a new carb top or whole rebuilt carb if you strip the threads in the carb . . . be gentle, but firm.

continued

the element, replacing it with a new one, and reinstalling the cover.

The type that fits inside the carburetor inlet boss (GM and late-model Ford products) requires undoing the fuel line fitting. Pull the fuel line out away from the carb (gently now, you don't want to bend the fuel line). Inside the carb housing you'll see the actual filter. Usually, there will also be a small easily-lost filter positioning spring . . . if you drop this spring, we guarantee you'll never find it again, so be prudent.

You can replace this type of filter, or you can discard it entirely in favor of an in-line type filter that is much harder to lose and that doesn't get clogged as often. This in-line type is now the most popular type of fuel filter since it's the easiest to install. It's also available in a kit that will include new fuel line fittings and extra, flexible fuel line.

The kit differs from the replacement-type filter in that the extra lengths of hose are included. The boxes for both contain four spring clamps.

To replace the filter on a car already equipped with an in-line filter, remove the clamps. The original-equipment clamps are pry-off things that you discard. Pull the hoses from the filter necks and discard the filter.

Fit a spring clamp onto each hose. This can be done by spreading the tangs of the clamps with an ordinary pair of pliers, but it ain't easy! Instead, try filing a notch in the top of each plier jaw . . . the notch will hold the tangs with ease. If you're not too good with a file, run on down to your friendly auto parts place and ask for a pair of hose clamp pliers.

Then install the filter, making sure the arrow on the side of the filter points toward the carburetor. With the hoses firmly in place, spread the tangs of the clamps and move them to positions on the hoses that coincide with where the filter necks fit inside the hose.

The replacement type kit takes about 30 minutes to install and requires a tubing cutter.

Find a six-inch section of fairly straight fuel line between the fuel pump and the carburetor. Using the tubing cutter, chop out the section. (after, of course, cleverly measuring the length of the new filter). Fit a short length of flexible fuel line on the necks of the filter and secure them with the clamps.

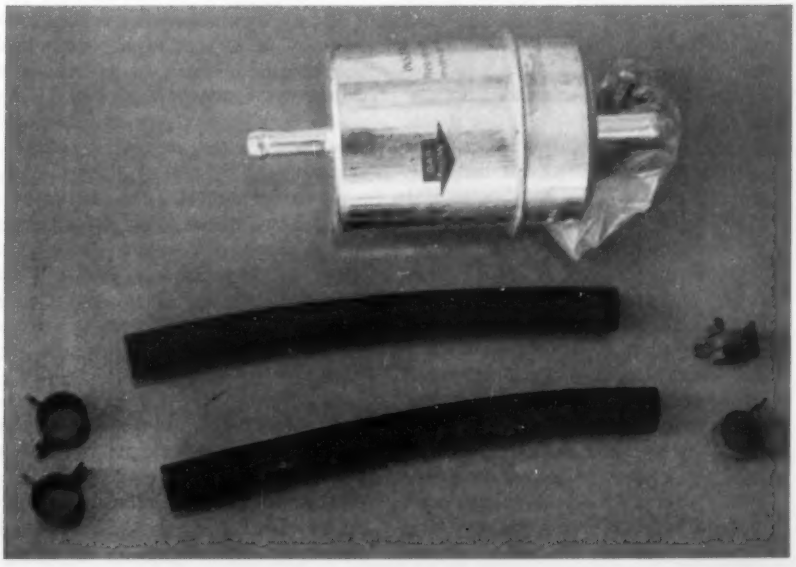
Position the entire assembly into the gap in the fuel line and secure the whole shootin' match with the other two clamps.

Oh yeah, check for leaks. We'd rather not have you running around with gasoline leaking out onto that hot engine.

IF: If you can manage to change the oil, air, and fuel filters in your car, you may have the confidence to move on to bigger and better things, like the automatic transmission and power brake filters. However, we won't get into those two types of filters here because, with very few exceptions, these filters do not routinely need changing. They are replaced when the parent unit is rebuilt. They both require more time, labor, and tools than the average backyard mechanic has at his or her disposal.

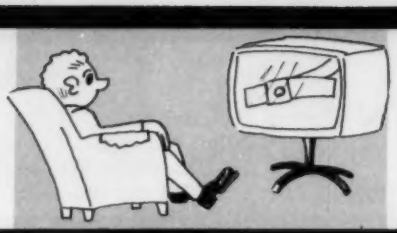
But if you managed to get those filters changed and your car still runs, maybe that means that there *are* a few other little jobs that you can do. The more little jobs you do, the more confidence you have, and then the more jobs you'll do . . . it's a very pleasant, money-saving circle.

If you save money doing routine maintenance yourself, you'll have the money to get those major safety-related problems ironed out, things like tires and front-end repairs. And that, after all, is what "The Backyard Mechanic" is all about!



True in-line type fuel filter mounts in the gas line, is easy to replace, and you can't strip threads in the carb housing. It's large size allows it to go longer periods between changes, too.

LETTERS to the EDITOR — BACKfire



58% WANT BAGS/ AUTOMATIC BELTS?

Is it really a puzzle? (Ref: "Double Clutch," Nov '78 DRIVER).

Where was the figure of 58% (preferring air bags or automatic belts) derived from? If *every* American driver had responded to a survey on this subject then maybe we could rely on this as a good percentage. I would answer your question as to there being any way of finding out what people honestly feel about a given subject, NO.

Of the people I talked to (between 15 and 20) only two knew what an automatic seat belt was. None had any knowledge of a survey. All were American drivers.

What does fatality rate decrease on newer cars really have to do with automatic seat belts? You said that 25% of VW Rabbit owners had disconnected them, which means only 75% are equipped for survey purposes compared to other Rabbits not equipped with them.

Now, let's take the newer Rabbit and consider the fatality rate of .78 per 100 million miles. Modifications on brake systems, fuel systems, and drive train will help reduce the stopping distance. What does that leave us? Nothing!

An answer to why only 16% of us are using the devices we already have is simply because Americans are basically lazy when it comes to doing for themselves. (If anyone is offended I have included myself.) How was the 16% figure derived at? No one knows if I use my safety equipment or if the people I talked to do.

Now to answer why 25% of the people who own cars equipped with automatic seat belts disconnect them: simply FEAR. (Sample: If I don't understand the system I eliminate it because I know I can do without it.) A person in fear of being trapped inside a burning vehicle with the left door inoperative may be a dangerous driver and also one who doesn't keep his mind on all aspects of safety due to a constant state of panic. That was the main concern of the people I talked to after they found out what automatic seat belts were.

Suggestion: A survey by DRIVER. What would that prove? Nothing, except maybe interesting to your readers.

CMC George A. Gibby, USN
PW DEPT NAS
Fallon, NV 89406

Although we are hearing more about collisions involving fire lately, the chances of an individual being trapped in a burning car are statistically miniscule–far below 1%. The driver has a better chance of escaping from a burning–or submerged–vehicle if he was restrained at the time of the crash because he is not so likely to have been dazed or rendered unconscious. In other words, if you're belted-in you're not so likely to get hit in the head. So far as statistics of the kind Chief Gibby is talking about (and that we talked about in the November issue) we wonder, too. But remember, 1100 TV sets in this country are monitored to see what millions of us like to watch on the tube. And the TV moguls insist that's a big enough sample.

MOTORCYCLES AND HELMETS

If it was legal for me as a TSgt with 14 years of service to ride without a helmet and I chose to do so, what would my superiors think of me? They would view me as a person whose only concern for safety depends on who is watching me. In other words, I would be considering "Safety for safety's sake" a worthless motto. Not a very rosy picture of a supervisor who is supposed to lead his subordinates through each day with an instilled sense of safety. Obviously, such a person shouldn't have been a supervisor to start with.

I've been riding for 18 years and I've about been through it all. You will never see me on the road or in the dirt without my brain bucket.

How do I feel about a mandatory helmet law? Repeal it! If a person cannot voluntarily practice safety, then the law does not make that person safe. If education does not make a person safe, then nothing will, and the law does nothing more than conceal a safety hazard, the individual's safety attitude.

TSgt Charles Morris, USAF
2171 E. 22nd Ave
Apache Junction, AZ 85220

"AN OFFENSIVE DRIVER"

In reply to "An Offensive Driver?" Oct '78 DRIVER, I have found driving concentration and habits such as those stated to be an absolute necessity here in Hawaii, especially on the island of Oahu where I am stationed.

Hawaiians pride themselves on their friendly Aloha spirit but as drivers they are among the worst, even worse than New York City. Because of the small island size, native Hawaiians have no long-distance highway driving experience. The H-1 Interstate will let you cross the island in less than one hour, even at 55 mph. But that law seems to be unheard of here where motorists cut in front, cut you off, change lanes without looking or signaling, and speed as fast as they can. Speed limit enforcement is inadequate at best, and the carpool lane reserved for vehicles carrying a minimum of three people is constantly violated by those carrying fewer.

To drive and stay alive here, one must continuously out-guess the other drivers and anticipate every situation and every possibility beforehand. So far I have been lucky. My guessing and anticipating have helped me stay alive on the highways.

2Lt Joel D'Aloise, USA
HHC DISCOM
Schofield Barracks, HI 96857

CATALYTIC CONVERTER FIRE HAZARD

As a reader of DRIVER since its first issue and a subscriber since Jan '71 (all issues in my library), I am convinced that DRIVER is the finest vehicle safety publication in the country.

I just recently had a $1100 fire damage to my car caused by parking at a curbside where dry pine needles had collected. We had a very dry September and October and were under a statewide "no-burn" mandate. Pine needles blanketed every curb in the neighborhood I was visiting, yet not once did the fire risk from the catalytic converter enter my mind as I parked at the curb of a friend's home.

Within 10 minutes the pine needles were ablaze and before my friend could turn on the garden hose or I could get into the car to move it, the wiring and most rubber items under the hood were burned beyond repair – not to mention fire damage to hood, right fender, right door, the air conditioner, air filter, etc. Only the alertness of a young boy prevented a total loss.

We had the fire out just as the Fire Department arrived, but the car had to be towed into the garage. Three weeks later certain electrical wire harnesses are still to be located before the vehicle can be made operative.

Many of my friends were totally unaware of the risk of a hot catalytic converter when parking over dry grass, leaves, pine straw, etc. Perhaps many of your readers share the same unawareness – or the "it can't happen to me" syndrome.

Keep up your fine publication.

Col Walter G. Vornbrock, USAF (Ret)
208 Woodland Hills
Tuscaloosa, AL 35401

It's been a long time since we've heard of a catalytic converter posing a fire hazard. We thought since most mechanics are now familiar with the symptoms that lead up to cat-con overheat that the fire problem was just about over. Your experience proves we were wrong.

Catalytic converters overheat because of one thing . . . they have to work too hard. An engine (for any one of a number of reasons) dumps unburned fuel into the exhaust system. The cat-con must catalytically convert the unburned fuel into clean emissions, and in the process of doing that, it overheats. Catalytic converters were designed to convert exhaust gases, not raw fuel, and the chemical process involved in the conversion of gasoline generates so much heat that the converter will overheat and either destroy the catalyst inside or cause a fire like you experienced.

However, we have never heard of a converter overheating without giving out warnings. The first sign is usually an easily detectable odor of sulfur, or rotten eggs. This means that the converter is being forced to convert more hydrocarbons than it can comfortably handle. The second sign is either an overheat light (if your car has such a device), or a definite emanation of heat from the car's floorboards in the area directly over the converter. This will also cause the adhesive used to secure the carpet or floormat to smoke or cause odors.

An even earlier warning of impending converter problems will usually be a decrease in gas mileage. This is a sure sign that all the gasoline isn't being used as well as it could be . . . and all that unused fuel has to go somewhere. That somewhere is always out the exhaust system, where the cat-con will have to cope with it.

If you notice your car's gas mileage going down, or if you detect stumbling, stalling, or rough idling, get it to your best mechanic ASAP, because it usually means eventual cat-con overheat or self-destruct.

Not only does an over-worked cat-con possibly create a fire hazard, it will lose its ability to convert emissions and will have to be replaced . . . and that costs more than a few bucks.

SHIPPING POVs

I'd like to ask a question relating to your Aug '78 article "Ban On Sending POVs to Japan Continues." Don't diesel engine cars such as a VW Rabbit, a Volvo, a Mercedes 300D or Oldsmobile satisfy Japan's pollution regulations?

LCDR D. Trader, USN
C.O. MSCO Taipei
Box 25
APO San Francisco 96263

*The primary concern about sending a POV to Japan or Okinawa doesn't lie just in its ability to meet (or fail) Japanese emission standards. The real hangup in the entire situation is that **any** POV going to Japan or Okinawa **must** go to Tokyo first to be inspected by the official inspection branch.*

Let's say the car does meet Japanese emission standards. Even though the engine and emission system may not need to be altered, there are still over 30 other items that will have to be modified to come into accord with Japanese laws. For instance, all lights must be reaimed to compensate for driving on the left side of the road.

There must be a high-speed warning buzzer system installed. Door handles and trim must be flush-mounted and not protrude. And the list goes on and on.

If your car doesn't meet emissions standards you can figure on a bill of almost $2,000 to completely "Japanize" the car. So it's still the best idea to either wait until you get to Japan to buy your car, or to buy one from a manufacturer that certifies certain of his models for operation in Japan and pick it up over there.

THE FIRST TURKEY

Just finished reading the Nov '78 issue of DRIVER. I liked the first "Turkey" but have one question. Who is going to recall it to install a rear bumper?

SSgt Mike Lowry, USAF
302 Trans Sq/LGTO
Rickenbacker AFB, OH 43217

Since our art staff designed this beauty, they are in charge of any recalls. Their attitude is surly, however. They say if they had wanted a rear bumper on the "Turkey," they'd have put one on in the first place!

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YOU CAN CALL ME FRED OR YOU CAN CALL ME ED OR YOU CAN CALL ME TED

LIGHT can be heavy

With all the new low calorie or light beers in the coolers today, you might think the brewers have finally come up with the solution to all your problems. You can drink without getting fat.

Well, the stuff is still alcohol. It'll get you drunk if you drink enough of it. Overindulgence and driving might just turn you into a skinny statistic instead of a fat one.

"You can all me 'thin,' and you can all me 'skinny,'

BUT YA DON'T HAS TA CALL ME 'SOBER'."

Photo by David Sims